DOE/ID-11021
March 2003
Revision 0

HWMA/RCRA Closure Plan for the TAN/TSF Intermediate-Level Radioactive Waste Management System

Phase I: Treatment Subsystem (TAN-616)

DOE/ID-11021
Revision 0

HWMA/RCRA Closure Plan for the TAN/TSF Intermediate-Level Radioactive Waste Management System

Phase I: Treatment Subsystem (TAN-616)

Published March 2003

Prepared for the
U.S. Department of Energy
Idaho Operations Office

ABSTRACT

The Test Area North/Technical Support Facility Intermediate-Level Radioactive Waste Treatment Subsystem, which includes the TAN-616 Liquid Waste Treatment Building, was an integral component of the Intermediate-Level Radioactive Waste Management System at Test Area North. This partial closure plan fulfills a milestone under Voluntary Consent Order Action Plan NEW-TAN-008 for closure of components addressed in this action plan that were determined to have managed hazardous waste. This plan is the first of three partial closure plans addressing Hazardous Waste Management Act/Resource Conservation and Recovery Act closure of the Intermediate-Level Radioactive Waste Management System, which is comprised of the feed subsystem (Collecting Tanks V-1, V-2, V-3, and Sump Tank V-9; addressed under the Federal Facility Agreement and Consent Order), the treatment subsystem (the TAN-616 facility and associated piping), and the holding tank subsystem (PM-2A tanks; addressed under the Federal Facility Agreement and Consent Order). The treatment subsystem, addressed in this plan, includes the TAN-607 decontamination room sump, Valve Pit #1 (TAN-1704), the TAN-615 east pit/sump, the TAN-616 head tank (V-5), the TAN-616 hold tank (15 gal), the TAN-616 pump room sump, the TAN-616 evaporator pit sump, TAN-616 evaporator pit lead shielding, and associated ancillary piping and equipment.

This closure plan specifies the role and boundaries of the Intermediate-Level Radioactive Waste Treatment Subsystem within the Intermediate-Level Radioactive Waste Management System. The current waste inventory and applicable hazardous waste numbers for the subsystem are provided. Finally, compliance with applicable tank system closure performance standards of Idaho Administrative Procedures Act 58.01.05.009 (40 Code of Federal Regulations 265.111 and 265.197) is included. This document also includes a description of activities required to complete closure and criteria to which closure will be certified.

CONTENTS

FIGURES

TABLES

ACRONYMS

ANP	Aircraft Nuclear Propulsion
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
COC	contaminant of concern
D&D	decontamination and decommissioning
DOE	U.S. Department of Energy
EDF	Engineering Design File
EPA	U.S. Environmental Protection Agency
FFA/CO	Federal Facility Agreement and Consent Order
FR	Federal Register
FSP	Field Sampling Plan
HWD	hazardous waste determination
HWMA	Hazardous Waste Management Act
HWN	hazardous waste number
IDAPA	Idaho Administrative Procedures Act
IDEQ	Idaho Department of Environmental Quality
IET	Initial Engine Test
ILRW	intermediate-level radioactive waste
INEEL	Idaho National Engineering and Environmental Laboratory
LPT	Low-Power Test
MLLW	mixed low-level waste
PE	professional engineer
PPE	personal protective equipment
PRG	Preliminary Remediation Goal
RCRA	Resource Conservation and Recovery Act

RWMC	Radioactive Waste Management Complex
STP	Shield Test Pool
TAN	Test Area North
TCE	trichloroethene
TSD	treatment, storage, and/or disposal
TSF	Technical Support Facility
USC	United States Code
VCO	Voluntary Consent Order
VOE	verification of empty

HWMA/RCRA Closure Plan for the TAN/TSF Intermediate-Level Radioactive Waste Management System

Phase I: Treatment Subsystem (TAN-616)

1. INTRODUCTION

The Test Area North (TAN), located at the northern end of the Idaho National Engineering and Environmental Laboratory (INEEL), was constructed in the 1950s to support the Aircraft Nuclear Propulsion (ANP) Program. The radioactive wastewater generated during the ANP Program required treatment and storage. The Intermediate-Level Radioactive Waste (ILRW) Management System was constructed at the Technical Support Facility (TSF) to collect, store, and treat ILRW generated throughout the TAN facilities.

Portions of the ILRW Management System managed waste determined to be hazardous in accordance with the Hazardous Waste Management Act (HWMA) (State of Idaho 1983)/Resource Conservation and Recovery Act (RCRA) (42 United States Code [USC] 6901 et seq.). Therefore, these portions of the system will be closed in accordance with applicable closure standards under the Idaho Administrative Procedures Act (IDAPA), "Interim Status Standards for Owners and Operators of Hazardous Waste Treatment, Storage and Disposal Facilities" (IDAPA 58.01.05.009) (40 Code of Federal Regulations [CFR] Part 265, Subparts G and J).

The TAN/TSF ILRW Management System is composed of three subsystems: the ILRW Feed Subsystem (Tanks V-1, V-2, V-3, and V-9), the ILRW Treatment Subsystem (Liquid Waste Treatment Building [TAN-616]), and the ILRW Holding Tank Subsystem (PM-2A tanks). The ILRW Management System closure will be conducted as independent partial closures. Closure plans will be submitted and implemented independently until final facility closure is achieved. For purposes of this closure approach, the "facility" is comprised of the three subsystems, which currently represent the unclosed portions of the ILRW Management System. Each partial closure will constitute a closure phase with a total of three phases completing closure of the facility. The phases are as follows:

- Phase I: ILRW Treatment Subsystem (TAN-616)
- Phase II: ILRW Feed Subsystem (Tanks V-1, -2, -3, and -9)
- Phase III: ILRW Holding Tank Subsystem (PM-2A Tanks).

Final facility closure of the ILRW Management System will be completed upon the completion of all three partial closure phases. Closure certification will be provided for each partial closure phase of the project.

This closure plan addressing the ILRW Treatment Subsystem, which is comprised of the TAN-616 building and associated ancillary equipment outside the building, has been written to fulfill a milestone of the Voluntary Consent Order (VCO) Action Plan NEW-TAN-008 (IDEQ 2000). The initial milestone submittal under VCO Action Plan NEW-TAN-008 was:

> *Complete a system identification for the portions of TAN-616 not managed under the [Federal Facility Agreement/Consent Order] and uniquely identify components addressed under this action plan.*

To adequately describe the TAN-616 system in accordance with the action plan requirements, the *Voluntary Consent Order NEW-TAN-008 System Identification* (INEEL 2001a) was prepared for submittal to the Idaho Department of Environmental Quality (IDEQ). This system identification was approved by IDEQ on July 30, 2001 (IDEQ 2001).

Completion of hazardous waste determinations (HWDs) and/or verification of empty (VOE) determinations, as appropriate, for TAN-616 components is the second milestone submittal related to the tank system listed in this VCO action plan:

> *Complete a hazardous waste determination for the systems identified as* [TAN-616 systems, vessels, and ancillary equipment].

Four separate HWD/VOE Engineering Design Files (EDFs) were prepared to support characterization of the TAN-616 components:

- "VCO NEW-TAN-008 TAN-616 Liquid Waste Treatment Facility Characterization" (EDF-2793) – Approved by IDEQ on November 16, 2001 (Magleby 2001)

- "VCO NEW-TAN-008 TAN-616 Liquid Waste Treatment Facility Characterization – Interior Units" (EDF-2879) – Approved by IDEQ on May 29, 2002 (IDEQ 2002a)

- "VCO NEW-TAN-008 Characterization – TAN-615 Pits/Sumps" (EDF-2167) – Approved by IDEQ on June 27, 2002 (IDEQ 2002b)

- "VCO NEW-TAN-008 TAN-616 Liquid Waste Treatment Facility Characterization – Influent and Effluent Units and Associated Piping External to TAN-616" (EDF-2333) – Approved by IDEQ on December 23, 2002 (IDEQ 2002c).

These EDFs include a determination for each component identified in the NEW-TAN-008 System Identification (INEEL 2001a) as to whether that component managed hazardous waste. Process flow and plot plan schematics previously prepared for the system identification have been modified, updated, and revised to reflect the findings of the characterization process and are included in this closure plan. The original system identification schematics showed all components subject to characterization in red. The closure process flow schematic (Schematic P-CLOS-NEW-TAN-008-616A; Figure 1-1) and the closure plot plan (Schematic P-CLOS-NEW-TAN-008-616B; Figure 1-2) included in this closure plan show components in red that were determined to have managed hazardous waste and for which closure activities are required. Components shown in blue on these closure schematics were determined to be either nonhazardous (for waste management components) or empty (for process/product components) and no closure activities are required. Components shown in yellow/orange on the closure schematics will be evaluated as a follow-on VCO milestone (See Section 2.2.6). A summary of the conclusions of the aforementioned characterization EDFs is included in the following four paragraphs.

Characterization EDF-2793 was prepared to provide VOE documentation of the water tank (V-11; 98TAN00421). This process/product tank was used to store cooling water. The tank was visually verified as empty using common industrial practices as described in EDF-2793. No further closure activities were determined to be required for this tank and associated cooling water components; these components were moved to Appendix C of the VCO Action Plan – Covered Matters that are Closed upon approval of EDF-2793. The color of these components has been changed to green for equipment that does not require closure activities and has been removed per the findings of EDF-2793.

Characterization EDF-2879 was prepared to address equipment and components located within the TAN-616 building proper. The EDF addresses the head tank (V-5; 98TAN00427), the evaporator (V-7; 98TAN00429), the receiver (V-8; 98TAN00430), the hold tank (15 gal) (98TAN00417), the cyclone separator (V-6; 98TAN00428), and the condenser (E-1; 98TAN00420). In addition, ancillary components addressed include the piping ancillary to the caustic tank (V-4; FFA/CO Site TSF-19) inside of TAN-616, the evaporator pit sump (98TAN00419) and ancillary equipment, the pump room sump (98TAN00651) and ancillary equipment, line 104-A2-6", and lead sheet shielding on the evaporator pit floor. Several of these tanks, components, and associated ancillary piping were determined to have been emptied and closed using standard industrial practices before 1980; consequently, no further closure activities are required. The tanks and components addressed in EDF-2879 that were emptied prior to 1980 include the cyclone separator (V-6), evaporator (V-7), receiver (V-8), and condenser (E-1). This equipment was last used in 1972 and was verified as empty (inspection of interior or not designed to retain waste) as described in EDF-2879. No further closure activities were determined to be required for this equipment; it will be moved to Appendix C of the VCO Action Plan – Covered Matters that are Closed upon approval of this closure plan. The remainder of the equipment addressed in EDF-2879 was determined to have managed hazardous waste and requires activities under closure. The color of the cyclone separator (V-6), evaporator (V-7), receiver (V-8), condenser (E-1), and associated ancillary equipment was changed to blue for equipment not requiring closure activities per the findings of EDF-2879. The head tank, hold tank, pump room sump, evaporator pit sump, and associated ancillary equipment remained red, indicating that these components required activities under closure.

Characterization EDF-2167 was prepared to address the TAN-615 east pit/sump (98TAN00409) and west pit/sump (98TAN00320), and ancillary equipment. The west pit/sump was determined, based on process knowledge and analytical data, to have managed nonhazardous waste. The east pit/sump was determined to be containing small quantities of residue that displayed a hazardous characteristic. Consequently, no further closure activities were determined to be required for the west pit/sump but are required for the east pit/sump. The west pit/sump was moved to Appendix C of the VCO Action Plan – Covered Matters that are Closed upon approval of EDF-2167. The east pit/sump required closure activities. As described later in this document, closure activities related to TAN-615 have been completed as interim actions under the NEW-TAN-008 Action Plan, and the color of the east pit/sump as well as the TAN-615 building on the process flow schematic (Schematic P-CLOS-NEW-TAN-008-616A; Figure 1-1) and the plot plan (Schematic P-CLOS-NEW-TAN-008-616B; Figure 1-2) have been changed to green for removed to reflect the findings of EDF-2167 and subsequent VCO interim actions and decontamination and decommissioning (D&D) efforts.

Characterization EDF-2333 was prepared to address the remainder of the components of the system that were not included in the three previous characterization EDFs. The remaining components consisted of a variety of lines external to the TAN-616 building. The lines were characterized as belonging to one of three categories: (1) piping that did not manage hazardous waste at any time and for which no further closure or VCO activities are required (changed to blue on the schematics), (2) piping outside building footprints that managed what would be considered to be hazardous waste prior to 1980 and emptied using common industrial practices prior to 1980 or only managed nonhazardous waste after 1980 (changed to yellow on the schematics), and (3) piping that managed hazardous waste after 1980 (left red on the schematics). Piping that never managed hazardous waste (changed to blue) was moved to Appendix C of the VCO Action Plan – Covered Matters that are Closed upon approval of EDF-2333. Piping that managed what would be considered hazardous waste but was emptied prior to 1980 (changed to yellow) is subject to follow-on VCO actions as specified in Section 2.2.6. Piping that managed hazardous waste after 1980 requires activities under closure and is described in detail in Section 2.2 of this closure plan.

This closure plan provides a general description of the ILRW Management System, as well as specific descriptions of the ILRW Treatment Subsystem components undergoing partial closure. The plan also includes the closure boundaries, a discussion of the current waste inventory, applicable U.S. Environmental Protection Agency (EPA) hazardous waste numbers (HWNs), and a detailed description of the activities that will be conducted to support closure certification. The HWMA/RCRA closure performance standard for tank systems (IDAPA 58.01.05.009 [40 CFR 265.111 and 265.197]) requires removal or decontamination of all waste residues, contaminated containment system components, contaminated soils, and structures and equipment contaminated with waste. The components listed in Section 2.2 of this plan will be closed by either removal or decontamination to the extent necessary to protect human health and the environment. Wherever possible, components will be removed and disposed in accordance with applicable regulations. Certain components, including steel piping embedded in the structure of the Maintenance and Assembly Building (TAN-607) and TAN-616; sections of piping buried beneath or adjacent to other structures for which removal is not possible; and concrete containment structures will be decontaminated in lieu of removal.

Soil sampling will be completed to assess if there has been a historical release of hazardous constituents to the environment from direct-buried steel components or concrete structures. Analytical data collected under this closure for soils located within an established Federal Facility Agreement and Consent Order (FFA/CO) (DOE-ID 1991) site will be used to support remedial investigation and/or remedial actions under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) (42 USC 9601 et seq.) and no further activities with regard to these soils will be required under this HWMA/RCRA closure plan.

Upon completion of equipment removal or decontamination activities, if the results of soil sampling and risk assessment indicate that soil contamination exists above risk-based criteria in an area not currently addressed in the FFA/CO, a New Site Identification under the FFA/CO will be completed. Contingent upon the approval of the New Site Identification by the agencies, final remediation of the soil will be addressed through the CERCLA process (i.e., once the soil contamination area has been accepted into the FFA/CO for implementation of CERCLA remedial investigation, no further activities with regard to the soils will be required under HWMA/RCRA closure). Conversely, if soil sampling results indicate that soil contamination, if present, is below risk-based criteria, no further activities with regard to the soils will be required under HWMA/RCRA closure.

Figure 1-1. Schematic P-CLOS-NEW-TAN-008-616A, Revision 0.

Figure 1-2. Schematic P-CLOS-NEW-TAN-008-616B, Revision 0.

2. FACILITY DESCRIPTION

Test Area North was established in the 1950s by the United States Air Force and Atomic Energy Commission ANP Program to support nuclear-powered aircraft research. As a nuclear research facility, radioactive wastewater was generated at several of the TAN facilities. Originally, TAN, which is located at the north end of the INEEL (see Figure 2-1), included the TSF, the Initial Engine Test (IET) Facility, the Flight Engine Test Facility, the Shield Test Pool (STP) Facility, and the Low-Power Test (LPT) Facility. The STP facility was later converted to the Experimental Beryllium Oxide Reactor, which was never used.

The TSF was designed to provide centralized management and services for the ANP Program. The service functions included equipment fabrication and assembly, fuel fabrication and inspection, post-irradiation fuel examination, disassembly and examination of equipment exposed to high-level radiation fields, equipment decontamination and repair, and low-level liquid waste concentration and storage in the ILRW Management System. The consolidation of these service functions at TSF eliminated much duplication at the various test facilities and largely limited the work at these locations to the installation and removal of prefabricated units and decontamination of permanently installed equipment (Kerr 1971).

2.1 ILRW Management System Description

The ILRW Management System was constructed in 1955 and began operation in 1958 (Evans and Perry 1993). It was designed to collect, store, and concentrate radionuclide-contaminated liquid waste from TAN facilities. Radioactive liquid waste generated throughout the TAN facilities was piped or trucked to the ILRW Management System from the IET Facility and the LPT Facility (Kerr 1971; Hogg et al. 1971). However, the majority of radioactive liquid waste generated at TAN was from the decontamination of both equipment and facilities at TSF (Kerr 1971).

The TAN/TSF ILRW Management System is composed of three subsystems: the ILRW Feed Subsystem (Tanks V-1, V-2, V-3, and V-9), the ILRW Treatment Subsystem (TAN-616), and the ILRW Holding Tank Subsystem (PM-2A tanks). Beginning in 1958, these three subsystems were used to collect and treat radioactive wastewater at TAN as follows:

- The feed subsystem was used to collect and store waste prior to treatment
- The treatment subsystem was used to concentrate the waste using evaporation, resulting in a waste concentrate stream
- The holding tank subsystem was used to collect and store the waste concentrate.

In 1971, a temporary aboveground evaporator (PM-2A) was installed to empty the holding tank subsystem. The PM-2A evaporator was used to empty the holding tanks (V-13 and V-14) and potentially for additional transfers of waste from the collecting tanks via the TAN-616 facility. The PM-2A evaporator was taken out of service in 1975 and all aboveground structures and equipment associated with this evaporator were subsequently removed.

In 1972, the TAN-616 evaporator system was removed from service. Subsequent to this date, the TAN-616 facility was used only as a waste transfer building. Between 1972 and 1974, waste collected in the feed subsystem may have been transferred directly to the holding tank subsystem for processing in the PM-2A evaporator. The TAN-616 facility was modified in 1974 to allow transfer of waste from the

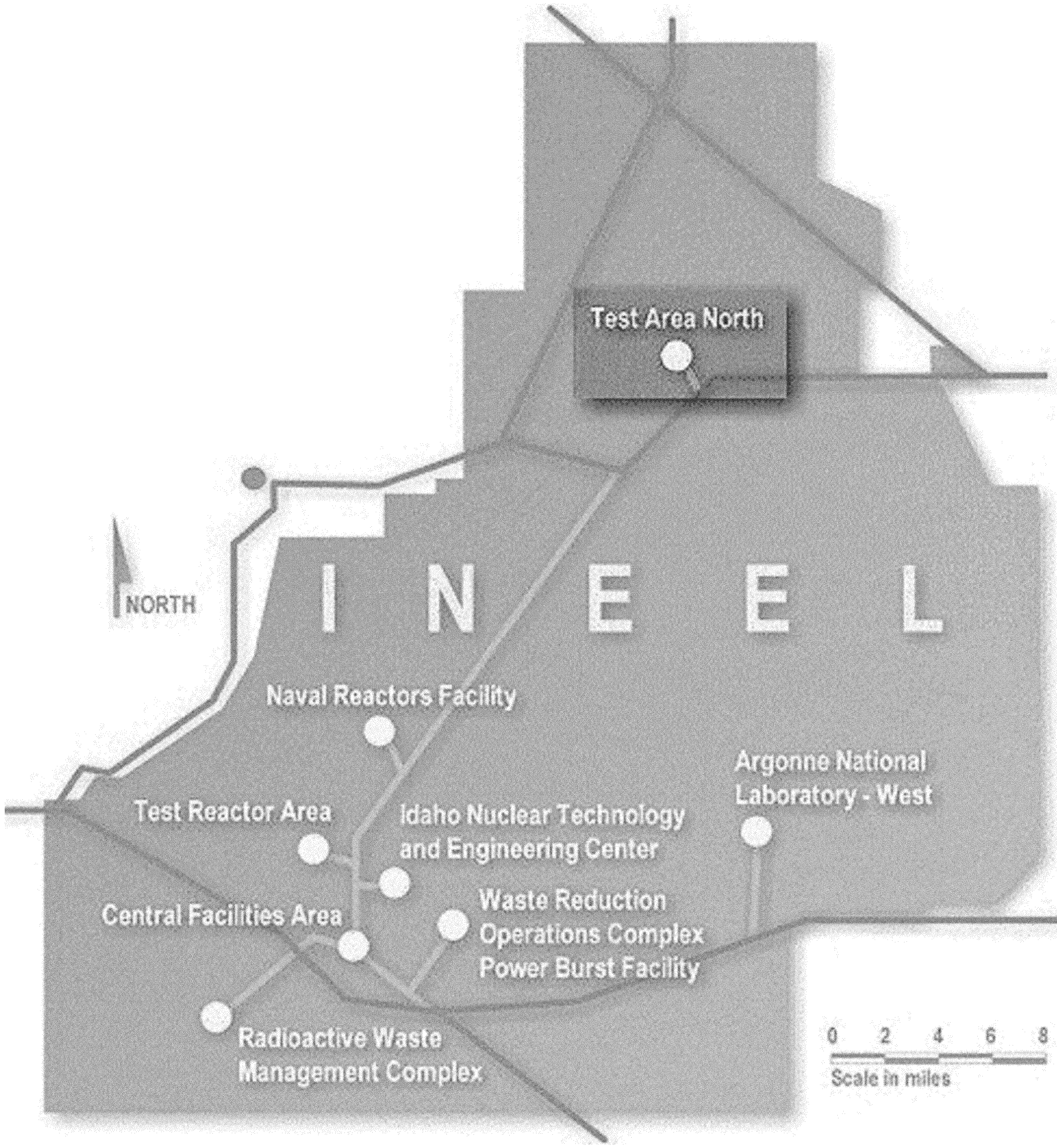

Figure 2-1. Map of the INEEL showing the location of TAN.

collecting tanks to a tank truck using equipment and piping inside the TAN-616 building. A vacuum pump and hold tank (15 gal) were added to the operating pump room and a small blue centrifugal waste transfer pump was added to the pump room. The vacuum pump and hold tank (15 gal) were used to prime the blue transfer pump. New piping was added to the pump room, operating pump room, caustic pump room, and building exterior; some existing piping was used to complete flow paths from the collecting tanks to the truck loading discharge. Waste from the collecting tanks was transferred to tanker trucks using this apparatus until sometime prior to 1981. Between 1981 and 1985, the collecting tanks were subsequently used for collection and storage. Transfer of waste from the collecting tanks by 1981 was performed using an in-tank submersible pump and pumping directly to tanker trucks.

The three subsystems are addressed under different regulatory frameworks. The feed subsystem (Tanks V-1, -2, -3, and -9) and holding tank subsystem (PM-2A tanks) are addressed under the FFA/CO (DOE-ID 1991) Sites TSF-09/18 and TSF-26, respectively. The treatment subsystem (the subject of this partial closure plan) is addressed under the VCO. A more detailed description of the treatment subsystem components addressed in this partial closure plan is provided in Section 2.2; the HWNs applicable to the waste managed in these components are provided in Section 3.2.

The lists of subsystem-specific components for Phase II, which includes the collecting tanks (V-tanks [TSF-09/18]) and Phase III, which includes the holding tanks (PM-2A tanks [TSF-26]), will be provided in the corresponding partial closure plans. Operational descriptions of the ILRW Feed and Holding Tank Subsystems are included in the subsequent sections of this closure plan for information only.

2.1.1 ILRW Feed System

The ILRW Feed Subsystem was used to collect, clarify, store, and transfer radioactive wastes to the ILRW Treatment Subsystem. The ILRW Feed Subsystem consisted of five components: a sump tank (V-9) [*1004[a]]; three collecting tanks (V-1, -2, and -3) [*1006, *1007, and *1008]; a sand filter [*1005]; as well as associated ancillary piping.

The ILRW Feed Subsystem collected radioactive wastes from various sources throughout TAN. A piping network[b] collected liquid waste from floor drains, sinks, sumps, tanks, and hoods in TAN-607, the Water Filtration Building (TAN-649), the Hot Cell Annex (TAN-633), the Maintenance Building (TAN-615), and the IET Control and Equipment Building (TAN-620). The wastes drained through this pipe system to either Valve Pit #2 [*1002] or Valve Pit #1 (TAN-1704) [*1003]. Valve Pit #2 drained to Valve Pit #1. From Valve Pit #1, the waste drained to the sump tank (V-9) [*1004], which was designed to clarify the liquid prior to introduction of the liquid into the collecting tanks. Liquid waste flowed through the sump tank (V-9) and into the collecting tanks (V-1, -2, and -3) [*1006, *1007, and *1008] where it was stored prior to concentration by evaporation. A caustic supply tank (V-4) supplied 50% sodium hydroxide solution to the collecting tanks for pH adjustment. The collecting tanks could also

---

a. Four digit equipment numbers preceded by an asterisk were assigned to all tanks and components associated with the TAN-616 Liquid Waste Treatment System as part of the system identification for VCO Action Plan NEW-TAN-008 (INEEL 2001a). These numbers were assigned to ensure consistency throughout compliance activities related to the ILRW Management System. These equipment numbers are not related to INEEL facility equipment numbers or to INEEL Tank Inventory Database identification numbers.

b. Although the inlet piping and Valve Pit #1 are operationally associated with the ILRW Feed System, this structure and piping were outside the established boundaries of the FFA/CO sites associated with the feed subsystem (FFA/CO sites TSF-09/18); consequently, this structure and piping were identified as part of the TAN-616 system in the system identification (INEEL 2001a).

receive wastes directly from the TAN-615 sumps (connected directly to Collecting Tank V-3) or from the LPT facility via a transfer truck through a standpipe extending to the ground surface from each of the collecting tanks (Kerr 1971; Hogg et al. 1971). The collecting tanks, sump tank, sand filter, and associated piping comprise the ILRW Feed Subsystem (Phase II).

2.1.2 ILRW Holding Tank Subsystem

Waste collected in the ILRW Feed Subsystem was concentrated by evaporation in TAN-616. Concentrated radioactive waste from the ILRW Treatment Subsystem evaporator was jetted to the two 50,000-gal underground holding tanks (PM-2A tanks, V-13 and V-14 [*1024 and *1025]) via two buried waste lines. The holding tanks are located approximately 750 ft south and 400 ft east of TAN-616. These tanks were used to receive and store waste concentrate from the TAN-616 evaporator until 1972 when the TAN-616 evaporator was removed from service. These tanks were designed to provide indefinite storage, as there is no permanent means to empty the tanks. From 1971 to 1975, these tanks were emptied using temporary piping connected to the PM-2A evaporator system. The PM-2A evaporator system was removed as a D&D activity in 1981 and 1982, at which time the tanks were emptied to their respective heels and the heels solidified with diatomaceous earth (Smith 1983). The holding tanks and associated piping comprise the ILRW Holding Tank Subsystem (Phase III).

2.2 ILRW Treatment Subsystem Description

A description of equipment identified in the VCO Action Plan NEW-TAN-008 System Identification (INEEL 2001a) and subsequently characterized as hazardous waste management equipment requiring closure activities in the EDFs (EDF-2167; EDF-2333; EDF-2879) is provided below. The ILRW Treatment Subsystem includes the TAN-607 decontamination room sump [*1001], Valve Pit #1 (TAN-1704 [*1003]), TAN-615 east pit/sump [*1010], head tank (V-5 [*1011]), hold tank (15 gal) [*1016], pump room sump [*1020], evaporator pit sump [*1021], and associated ancillary piping and equipment. A list of the ILRW Treatment Subsystem components that were determined to have managed hazardous waste is included in Table 2-1.

2.2.1 Tanks

The tanks included in the ILRW Treatment Subsystem are the head tank [*1011] and the hold tank (15 gal) [*1016]. Both units are shown on Schematic P-CLOS-NEW-TAN-008-616A (see Figure 1-1).

2.2.1.1 Head Tank. The head tank (V-5; 98TAN00427) is a 1,000-gal elliptical bottom, flat top, vertical, stainless steel tank, located in the TAN-616 evaporator pit. It has an outside diameter of 1.8 m (6 ft) and a height of 2.1 m (7 ft). The head tank received process waste from the collecting tanks (V-1, V-2, and V-3) via Pumps P-1 and P-1A. The head tank gravity-fed the evaporator (V-7). This tank was operational from 1958 until approximately 1972 as a feed unit to the evaporator. The manway at the top of the head tank was open and solids were present in the tank bottom when sampled in 1993/1994 (Olaveson et al. 1994) and January 2001. Based on information from measurements during a May 2001 entry, it is estimated that approximately 0.5 in. to 4.5 in. (~2 ft^3) of sediment remains in the bottom of the head tank.

2.2.1.2 Hold Tank (15 gal). The hold tank (15 gal) (98TAN00417) is located in the operating pump room. The hold tank (15 gal) is a vertical cylinder that is 0.3 m (1 ft) in diameter and 0.6 m (1.8 ft) in height and has elliptical heads. It was installed in 1974 as part of a vacuum system that was used to prime the new blue transfer pump, which allowed transfer of waste from the collecting tanks (V-1, -2, and -3) to the swing-arm loading pipe mounted on the side of the building. The vacuum pump and hold

Table 2-1. ILRW Treatment Subsystem components that were determined to have managed hazardous waste.

Reference Number	Description	INEEL Unit Number
Tanks		
*1011	Head Tank	V-5; 98TAN00427
*1016	Hold Tank (15 gal)	98TAN00417
Piping		
*3020	TAN-607 Decontamination Room Drainlines	N/A
*3021a	TAN-607 Decontamination Room Sump (ID # 01TAN00001) Discharge Line	2” WDA-10027
*3021c	TAN-607 Decontamination Room Sump (ID # 01TAN00001) Discharge Line	2” WDA-10027
*3022	TAN-607 Decontamination Room Sump (ID # 01TAN00001) Discharge Line (TAN-666 Construction Cross-Tie)	N/A
*3029b	Replacement Valve Pit #2 (TSF-21) – Valve Pit #1 (TAN-1704; ID # 98TAN00414) Drainline	4” WDA-10023
*3029c	Replacement Valve Pit #2 (TSF-21) – Valve Pit #1 (TAN-1704; ID # 98TAN00414) Drainline	4” WDA-10023
*3032a	Valve Pit #1 (TAN-1704; ID # 98TAN00414) – Sump Tank (V-9; 98TAN00431) Drainline	3” A2-101
*3032b	Valve Pit #1 (TAN-1704; ID # 98TAN00414) – Sump Tank (V-9; 98TAN00431) Drainline	3” A2-101
*3033a	Valve Pit #1 (TAN-1704; ID # 98TAN00414) – Sump Tank (V-9; 98TAN00431) Drainline	6” A2-102
*3033b	Valve Pit #1 (TAN-1704; ID # 98TAN00414) – Sump Tank (V-9; 98TAN00431) Drainline	6” A2-102
*3034b	Sump Tank (V-9; 98TAN00431) – TAN-616 Drainline[a]	6” A2-104
*3037a	Collecting Tank (V-1, ID # 98TAN00416) Feed Line[a]	6” A2-104
*3038a	Collecting Tank (V-2; ID # 98TAN00423) Feed Line[a]	6” A2-104
*3039a	Collecting Tank (V-3; ID # 98TAN00424) Feed Line[a]	6” A2-104
*3040b	Collecting Tank (V-1, ID # 98TAN00416) Suction Line[a]	4” A2-105
*3041b	Collecting Tank (V-2; ID # 98TAN00423) Suction Line[a]	4” A2-105
*3042b	Collecting Tank (V-3; ID # 98TAN00424) Suction Line[a]	4” A2-105
*3043	Process Pump Inlet Header	4” A2-105
*3044	Process Pump Discharge Line/Collecting Tank Return Line	4” A2-106
*3045a	Collecting Tank (V-1, ID # 98TAN00416) Return Line[a]	4” A2-106
*3046a	Collecting Tank (V-2; ID # 98TAN00423) Return Line[a]	4” A2-106
*3047a	Collecting Tank (V-3; ID # 98TAN00424) Return Line[a]	4” A2-106
*3048	Head Tank (V-5; 98TAN00427) Charge Line	3” A2-107
*3049	Head Tank (V-5; 98TAN00427) Overflow Line	4” A2-118/4” A2-117/4” A2-119
*3050	Head Tank (V-5; 98TAN00427) Discharge Line	2” A2-108
*3059	TAN-616 Evaporator (V-7; 98TAN00429) Bottoms Discharge Header	4” A2-123

Table 2-1. (continued).

Reference Number	Description	INEEL Unit Number
*3060a	TAN-616 Evaporator (V-7; 98TAN00429) Bottoms Discharge Line	4” HDA-10034
*3061a	TAN-616 Evaporator (V-7; 98TAN00429) Bottoms Discharge Line	4” HDA-10033
*3070a	Blue Pump Prime Line	N/A
*3070b	Vacuum Pump Inlet Line	N/A
*3070c	Vacuum Pump Drainline	N/A
*3071	Floor Sink Drainline	N/A
*3079	Pump Room Sump (ID # 98TAN00651) Discharge Line	1” A2-901
*3080	Evaporator Pit Sump (ID # 98TAN00419) Discharge Line	1” A2-901
*3081	TAN-616 Sump Discharge Header	2” A2-901
*3098	Evaporator Header Return Line	2” A2-120
*3099	Evaporator Bypass Line	4” A2-122
N/A	New 2” Piping	N/A
Pumps/Jets		
*2001	TAN-607 decontamination room sump pump	SP-201B
*2004	Process pump	P-1
*2005	Process pump	P-1A
*2011	Concentrate transfer jet	J-6
*2015	Vacuum pump	N/A
*2017	TAN-616 pump room sump jet	J-5
*2018	TAN-616 evaporator pit sump jet	J-4
N/A	New transfer pumps	N/A
Structures		
*1001	TAN-607 Decontamination room sump	01TAN00001
*1003	Valve Pit #1	TAN-1704; 98TAN00414
*1010	TAN-615 east pit/sump	98TAN00409
*1020	TAN-616 Pump room sump and floor	98TAN00651
*1021	TAN-616 Evaporator pit sump, floor, and walls	98TAN00419
Miscellaneous		
*2014	Floor sink	N/A
N/A	Lead sheeting	N/A

a. Any contents within the lines between the TAN-616 building and Tanks V-1, V-2, and V-3 will be removed as part of the TSF-09 remedial action and managed under CERCLA with the contents of these tanks. Any contents within line 104-A2-6”, located inside TAN-616, will be removed and managed under CERCLA as part of the contents removal for V-1, V-2, V-3, and V-9 (FFA/CO Sites TSF-09 and TSF-18).

tank (15 gal) were used to temporarily apply negative gauge pressure to the blue pump discharge line, thereby flooding the pump and the suction lines from the collection tanks. The hold tank (15 gal) was most likely used from its installation in 1974 until sometime prior to 1981. Installation of the transfer piping and a vacuum pump were performed at the same time as the installation of this tank.

2.2.2 Piping and Ancillary Equipment

2.2.2.1 Description. The TAN/TSF ILRW Treatment Subsystem includes waste transfer piping as shown on Schematics P-CLOS-NEW-TAN-008-616A and -616B (see Figures 1-1 and 1-2). The piping included in the ILRW Treatment Subsystem that requires HWMA/RCRA closure activities is shown in red on the schematic. The necessity of closure activities was determined based upon characterization results, which are included in the characterization EDFs (EDF-2167; EDF-2333; EDF-2879). A list of piping requiring closure activities is provided in Table 2-1.

2.2.2.2 Piping Boundaries. Inlet and outlet boundaries have been established to define breakpoints for piping requiring closure activities between the ILRW Treatment Subsystem and the ILRW Feed and Holding Tank Subsystems. The boundaries for the ILRW Treatment Subsystem are listed below and shown on Schematic P-CLOS-NEW-TAN-008-616A (Figure 1-1):

1. Inlet and outlet lines, 2" WDA-10027 [*3021c] and 4" WDA-10023 [*3029b], that were formerly connected to Valve Pit #2 were cut and capped near the valve pit in 1993 (see Schematic P-CLOS-NEW-TAN-008-616B [Figure 1-2]). These lines were determined to have managed hazardous waste and will be addressed under this closure plan to the point at which they were cut and capped in 1993. Valve Pit #2 and associated pipe stubs will be addressed as part of the holding tank (V-13 and V-14; PM-2A tanks) subsystem closure (Phase III).

2. The discharge lines from Valve Pit #1 to the sump tank (V-9) have been cut and capped inside the valve pit (INEEL 2001a). These lines (101-A2-3" and 102-A2-6") were determined to have managed hazardous waste and will be addressed under this closure plan to within 6 in. outside the valve pit. The portions of these lines from 6 in. outside the valve pit to the sump tank (V-9) will be addressed as part of the feed subsystem closure (Phase II).

3. Lines located inside TAN-616 that connect the TAN-616 building to the collecting tanks (V-1, -2, and -3) and the sump tank (V-9) were determined to have managed hazardous waste and will be addressed under this closure plan to 6 in. outside the TAN-616 building wall. The remainder of these lines will be included as part of the feed subsystem closure (Phase II) (see the NEW-TAN-008 System Identification [INEEL 2001a] Schematics P-VCO-NEW-TAN-008-616E through -616K for detailed piping plans and sections for piping inside and east of TAN-616). The contents of the lines between the TAN-616 building and Tanks V-1, V-2, and V-3 will be removed as part of the TSF-09 remedial action and managed under CERCLA with the contents of these tanks. The contents of line 104-A2-6”, located inside TAN-616, will be removed and managed under CERCLA as part of the contents removal for V-1, V-2, V-3, and V-9 (FFA/CO Sites TSF-09 and TSF-18).

2.2.3 Pumps and Jets

The following pumps and jets, shown on Schematic P-CLOS-NEW-TAN-008-616A (see Figure 1-1) and listed in Table 2-1, were determined to have managed hazardous waste and are included as part of the HWMA/RCRA partial closure of the ILRW Treatment System:

- TAN-607 Decontamination Room Sump Pump—This pump was used to transfer liquids that have subsequently been characterized as hazardous waste (see Section 3) from the decontamination room sump to Valve Pit #2. This pump was actively used from 1975 until the mid-1980s, and was not used thereafter.

- Process Pumps (P-1 and P-1A)—These pumps, located in the TAN-616 pump room, were used from 1958 to 1975 to transfer waste from the collecting tanks to the head tank (V-5) or the holding tanks (PM-2A tanks, V-13 and V-14). The piping connected to these pumps was part of the 1974 upgrade waste transfer flow path, which has been determined to be hazardous waste and which was used until sometime prior to 1981. As a result, hazardous waste may have flowed into or through the pumps until sometime prior to 1981.

- Concentrate Transfer Jet (J-6)—This jet, located in the TAN-616 evaporator pit, was used from 1958 to 1972 to transfer waste concentrate from the evaporator (V-7) to the holding tanks (PM-2A tanks, V-13 and V-14). The jet may have been used until 1975 to transfer waste directly from the collecting tanks (V-1, -2, and -3) to the holding tanks. This component will be closed as equipment ancillary to the head tank (V-5; 98TAN00427).

- Vacuum Pump—This pump is located in the operating pump room. It was installed in 1974 as part of a vacuum system that was used to prime the new blue transfer pump, which allowed transfer of waste from the collecting tanks (V-1, -2, and -3) to the swing-arm loading pipe. The vacuum pump and hold tank (15 gal) were used to temporarily apply negative gauge pressure to the blue pump discharge line, thereby flooding the pump and the suction lines from the collection tanks. The hold tank (15 gal) was most likely used from its installation in 1974 until sometime prior to 1981. This pump may have managed hazardous waste from the collecting tanks during the pump priming operation.

- TAN-616 Pump Room Sump Jet (J-5) and Evaporator Pit Sump Jet (J-4)—These jets were used to transfer waste from the sumps to the collecting tanks (V-1, -2, and -3) via Valve Pit #1 and the sump tank (V-9). These jets are ancillary to the respective sumps.

- New Transfer Pumps—These pumps were installed in 1974 and were used to transfer waste from the collecting tanks (V-1, -2, and -3) to the swing-arm loading pipe attached to the building. The pump and swing arm may have been used from their installation in 1974 until sometime prior to 1981. These pumps were used to transfer hazardous waste from the collecting tanks until sometime prior to 1981.

2.2.4 Structures

A discussion of the physical configuration of the valve pit and the sumps included in the ILRW Treatment Subsystem is included below. The structures included in the ILRW Treatment Subsystem are the TAN-607 decontamination room sump [*1001], Valve Pit #1 [*1003], the TAN-615 east pit/sump [*1010], the TAN-616 pump room sump [*1020], and the TAN-616 evaporator pit sump [*1021]. Schematics P-CLOS NEW-TAN-008-616A (Figure 1-1) and P-CLOS NEW-TAN-008-616B (Figure 1-2) show the process flow schematic and system plot plan showing each of these units.

2.2.4.1 TAN-607 Decontamination Room Sump. The TAN-607 decontamination room sump (01TAN00001) is a 600-gal sump that received low-level radioactive waste discharges from the decontamination room. The sump measures 1.2 m (4 ft) by 1.2 m (4 ft) by 1.6 m (5.0 ft) in depth. The decontamination room was active from 1957 to approximately 1975 (INEEL 2001a). From 1975 until the mid-1980s, the decontamination room was maintained in standby status and operated periodically. From the mid-1980s to February 1990, the facility was maintained in reserve status but not used. The sump currently manages liquid waste residual that has been characterized as hazardous (see Section 3).

2.2.4.2 Valve Pit #1. Valve Pit #1 (TAN-1704; 98TAN00414) contains piping that transferred low-level radioactive waste from Valve Pit #2, TAN-607, TAN-649, and the TAN-616 sumps to the sump tank (V-9). The waste transferred from Valve Pit #2 and TAN-616 was determined to have been hazardous. The dimensions of the valve pit are: 1.5 m (5 ft) by 1.6 m (5.3 ft) by 2.9 m (9.5 ft) in depth. The calculated internal volume of the valve pit is 1,895 gal (INEEL 2001a). The valve pit served as ancillary equipment to waste lines that transferred hazardous waste (See Table 2.1) and may have been contaminated by leakage from the valves located in the pit.

Valve Pit #1 effluent lines (3” A2-101 and 6” A2-102) discharged to Sump Tank V-9 (FFA/CO Site TSF-18). The lines have been cut and capped inside the valve pit. During a 2001 inspection, approximately 1 ft of water (approximately 200 gal), presumably rainwater or snow melt infiltration, was noted in the bottom of the valve pit.

2.2.4.3 TAN-615 East Pit/Sump. The TAN-615 east pit/sump (98TAN00409) was configured to discharge directly to Collecting Tank V-3 (FFA/CO Site TSF-09). The sump is 2.4 m (8 ft) by 4.3 m (14 ft) by 2.4 m (8 ft) in depth (11 ft 9 in. for the pit sump depth). The east pit was also known as the actuator pit. It was used for control rod drive mechanism tests for Loss-of-Fluid Test fuel assemblies (INEEL 2001a). The sump/pit contained a small amount of residual material that was determined to exhibit the toxicity characteristic for metals (see Section 3). The waste in the sump was removed, the sump was decontaminated, and waste was disposed of as hazardous, in accordance with EDF-2167 as a VCO interim action. Documentation of all waste removal activities and subsequent characterization and disposal will be included in the professional engineer (PE) certification for the partial closure of this tank system.

2.2.4.4 Pump Room Sump. The TAN-616 pump room sump (98TAN00651) was used to provide containment and collection of potential leakage in the TAN-616 pump room. A steam eductor (jet) was used to transfer liquids to piping in Valve Pit #1 (TAN-1704), which subsequently discharged to the sump tank (V-9) and to the collecting tanks (V-1, -2, and -3). The sump is 0.6 m (2 ft) in length, 0.6 m (2 ft) in width, and 0.5 m (1.5 ft) in depth. There are no records of liquid in the pump room sump, either during facility operation or after the facility was inactivated. The pump room sump was noted as dry and contained a layer of sediment in the bottom during entries in October 2000. The sump functioned as part of the secondary containment system for transfer equipment located in the pump room and it potentially collected leakage from this equipment. Approximately 1 ft^3 of sediment was removed from this sump as an interim action under the VCO in September 2002. Documentation of all waste removal activities and subsequent characterization and disposal will be included in the PE certification for the partial closure of this tank system.

2.2.4.5 Evaporator Pit Sump. The evaporator pit sump (98TAN00419) was used to provide containment and collection of potential leakage in the TAN-616 evaporator pit. A steam eductor (jet) was used to transfer liquids to piping in Valve Pit #1 (TAN-1704), which subsequently discharged to the sump tank (V-9) and to the collecting tanks (V-1, -2, and -3). The sump is 0.6 m (2 ft) in length, 0.6 m (2ft) in width, and 0.5 m (1.5 ft) in depth. The evaporator pit sump was noted to have contained liquid (presumably infiltration) during 1994 entries (Olaveson et al. 1994). The liquid present in the evaporator pit sump in 1994 is thought to have resulted from precipitation infiltration before the roof was repaired in fall 1993 (Evans and Perry 1993). The evaporator pit sump received process waste releases during facility operation. The evaporator vessel reportedly failed twice during operation and leaked process waste onto the evaporator pit floor. The quantities of hazardous waste released and amounts that reached the sump during facility operation are unknown. The evaporator pit sump was dry and full of sediment during entries in December 2000 and January 2001.

2.2.5 Miscellaneous Components

2.2.5.1 Lead Shielding. There are approximately 25 irregularly shaped lead sheets on the floor of the evaporator pit that are currently providing shielding, presumably to residual radioactive contamination associated with the concrete floor. The lead shielding will be removed during closure activities to allow access to the contaminated concrete beneath it and will be managed as a hazardous waste upon generation.

2.2.5.2 Floor Sink. The floor sink is located in the TAN-616 operating pump room and was used to collect drainage from the pump priming vacuum system installed in 1974. The floor sink would have collected any hazardous waste liquid transferred from the collecting tanks (V-1, -2, and -3) through the hold tank (15 gal) and vacuum pump and allowed the liquid to drain by gravity to the pump room sump. The floor sink may have been used to manage hazardous waste from 1974 until sometime before 1981.

2.2.6 VCO Actions for Piping not included as part of this Closure

Buried piping identified in Table 2-2, which is outside TAN building footprints, will be evaluated as a follow-on VCO milestone. This piping ceased management of waste before 1980 that would have been defined as hazardous after the promulgation of RCRA in 1980. The piping was either gravity-drained and inactive before 1980 or only managed nonhazardous waste after 1980.

The piping that will be evaluated is shown in yellow on Schematics P-CLOS-NEW-TAN-008-616A (Figure 1-1) and P-CLOS-NEW-TAN-008-616B (Figure 1-2). For further information regarding this piping, see the system identification document (INEEL 2001a) and EDF-2333.

The VCO follow-on activities will evaluate potential for past releases and may include sampling and/or visual evaluation. The specific actions that will be taken to address this piping will be agreed to when the milestone is established. The milestone and requirements will be negotiated as part of the VCO process, separate from this closure plan. Addressing these lines as a subsequent VCO milestone is not a criterion for certification of the ILRW Treatment Subsystem closure and this piping is not addressed further in this partial closure plan.

Table 2-2. Lines for which the direct-buried portions outside building footprints are subject to evaluation for HWMA/RCRA-required actions.

Reference Number	Description	INEEL Line Number
*3009	TAN-607 Laboratory Drain Header	3” HDA-10031
*3012	TAN-607 Hot Shop Drain Header	6” HDA-10030
*3016	TAN-607 Room 101 (Hot Shop) Sump Drainline	N/A
*3017	TAN-607 Room 101 (Hot Shop) Sump Drainline	N/A
*3018	TAN-607 Warm Shop Drain Header	6” HDA-10029
*3025	TAN-633 Hot Cell Annex Drainline	N/A
*3026	TAN-633 Hot Cell Annex Drainline	N/A
*3027a	TAN-633 Hot Cell Annex Drain Header	3” WDA-10024
*3027b	TAN-633 Hot Cell Annex Drain Header	3” WDA-10024
*3031	TAN-633 Hot Cell Annex Waste Diversion Drainline	N/A
*3058a, b, c	TAN-616 Condensate Discharge Header	4” WDC-10021
*3060b	TAN-616 Evaporator Bottoms Transfer Line	4” HDA-10034
*3061b	TAN-616 Evaporator Bottoms Transfer Line	4” HDA-10033
*3062	TAN-616 Evaporator Bottoms Transfer Line	N/A

3. TAN-616 TANK SYSTEM CURRENT AND MAXIMUM WASTE INVENTORIES AND CHARACTERISTICS

3.1 Current and Maximum Waste Inventories

Table 3-1 lists each ILRW Treatment Subsystem unit that was determined to have managed hazardous waste, the current and maximum waste inventories of each unit, and the applicable EPA HWNs.

3.2 Waste Sources and Characteristics

Based on sampling data and process knowledge, HWNs are applicable to the subsystem as specified in Table 3-1. Trichloroethene (TCE) was used for its solvent properties in the TAN-607 Decontamination Room, at concentrations that made it a listed waste once disposed as spent liquid. The disposal of spent TCE to the decontamination room sump, and pumping of the sump, resulted in the application of the F001 listed waste number to the decontamination room sump and downstream components as specified in Table 3-1.

The application of the toxicity characteristic (40 CFR 261.24) HWNs for the specified metals: cadmium (D006), lead (D008), and mercury (D009) (as indicated in Table 3-1) is based upon analytical data from sampling of the sump and tank contents. Further information about the characterization of the units in the ILRW Treatment Subsystem can be found in the applicable EDFs.

Table 3-1. Waste inventory and EPA HWNs resulting from characterization of ILRW Treatment Subsystem units.

	Type of Waste	Pre-Closure Waste Inventory	Maximum Capacity (gal)	EPA Hazardous Waste Numbers
Head Tank (V-5 [*1011])	Sediment	~2 ft^3	1,000	F001[a]
Hold Tank (15 gal) [*1016]	N/A	0	15	F001[a]
TAN-607 Decontamination Room Sump [*1001]	Liquid	Residual	600	F001, D008, D009[b]
Pump Room Sump [*1020]	Sediment	~1 ft^3 [c]	37	F001, D008, D009[d]
Evaporator Pit Sump [*1021]	Sediment	37 gal[e]	37	F001, D006, D008[a]
Valve Pit #1 (TAN-1704, [*1003])	Liquid	200 gal	1,895	F001[b]
TAN-615 East Pit/Sump [*1010]	Sediment	0[f]	6,700	D006, D008[g]

a. EDF-2879.

b. EDF-2333.

c. The contents of the pump room sump were removed and managed appropriately as an interim action under the VCO in September 2002.

d. The waste in the pump room sump was initially characterized in EDF-2879 as being hazardous with the applicable waste codes being F001 and D008. During interim action waste removal activities, mercury was discovered in the sump and the appropriate waste code (D009) has been assigned to the waste.

e. INEEL 2001b.

f. The TAN-615 east pit/sump contained only a small amount of residual material, which has been removed and managed appropriately as an interim action under the VCO.

g. EDF-2167.

4. CLOSURE OF THE ILRW TREATMENT SUBSYSTEM

This section specifies the activities required to comply with the closure performance standard (IDAPA 58.01.05.009 [40 CFR 265.111]) for the ILRW Treatment Subsystem and provides details as to how these activities will be completed.

The closure performance standards identified in IDAPA 58.01.05.009 (40 CFR 265.111) are:

1. The owner or operator must close the facility in a manner that minimizes the need for further maintenance (IDAPA 58.01.05.009 [40 CFR 265.111(a)]).

2. The owner or operator must close the facility in a manner that controls, minimizes, or eliminates to the extent necessary to protect human health and the environment, post-closure escape of hazardous waste, hazardous constituents, leachate, contaminated runoff, or hazardous waste decomposition products to the ground or surface waters or to the atmosphere (IDAPA 58.01.05.009 [40 CFR 265.111(b)]).

3. The owner or operator must close the facility in a manner that complies with the closure requirements of this subpart, including, but not limited to, the requirements of 40 CFR 265.197, 265.228, 265.258, 265.280, 265.310, 265.351, 265.381, 265.404, and 264.1102 (IDAPA 58.01.05.009 [40 CFR 265.111(c)]).

4.1 Activities to Achieve Compliance with the Closure Performance Standard

4.1.1 Standard 1

- Standard 1: The owner or operator must close the facility in a manner that minimizes the need for further maintenance (IDAPA 58.01.05.009 [40 CFR 265.111(a)]).

The activities required to minimize further maintenance of the ILRW Treatment Subsystem are:

1. Remove waste inventory

2. Remove to the extent possible all system components.

4.1.1.1 Remove Waste Inventory. Six of the units included in the ILRW Treatment Subsystem HWMA/RCRA closure contained pre-closure inventories of waste as described in Table 3-1. Information related to the characterization and disposal of the hazardous waste inventory from each of the six units will be included in the PE certification for the closure of this tank system.

The waste inventory contained within the TAN-616 pump room sump has been removed from the pump room sump as a VCO interim action. This waste has been managed as specified in Section 4.2 of this closure plan.

A small amount of residual material was contained within the TAN-615 east pit/sump (98TAN00409 [*1010]). This material has been removed as an interim action under the VCO. The TAN-615 east pit/sump had residual sediment in the bottom that displayed the characteristic of toxicity for lead and cadmium. The residual sediment was managed as specified in Section 4.2 of this closure plan.

The TAN-616 evaporator pit sump (98TAN00419 [*1021]) and the head tank (V-5; 98TAN00427 [*1011]) currently contain sediment. This material will be removed using standard industrial practices (hand tools, vacuum, etc.) and managed as discussed in Section 4.2.

The TAN-607 decontamination room sump (01TAN00001 [*1001]) and Valve Pit #1 (TAN-1704; 98TAN00414 [*1003]) currently contain residual aqueous waste. This liquid will be pumped or removed using suitable liquid removal equipment and managed as discussed in Section 4.2.

Any contents within the lines between the TAN-616 building and Tanks V-1, V-2, and V-3 will be removed as part of the TSF-09 remedial action and managed under CERCLA with the contents of these tanks. Any contents within line 104-A2-6", located inside TAN-616, will be removed and managed under CERCLA as part of the contents removal for Tanks V-1, V-2, V-3, and V-9 (FFA/CO Sites TSF-09 and TSF-18).

4.1.1.2 Remove System Components. When possible, the closure approach for system components is removal and subsequent off-Site disposal. Most components will be removed in lieu of decontamination. A list of components that will be removed during closure is provided in Table 4-1. These components will be removed using standard industrial practices and subsequently disposed as described in Section 4.2.

All piping and components located within TAN-616 will be removed with the exception of piping that is embedded within the structural concrete of the building. The lines, which include embedded sections, expected to be approximately 2 to 5 ft in length each, are addressed in Section 4.1.2.2 of this closure plan. If necessary, temporary plugs or covers will be used to isolate these embedded sections of piping from ongoing closure activities within the building.

The decontamination room discharge line 2" WDA-10027 [*3021a, *3021c, *3022] will be removed except as specified in Section 4.1.2.2.

Table 4-1. ILRW Treatment Subsystem components that will be removed during closure.

Reference Number	Description	INEEL Unit Number
*1003	Valve Pit #1	TAN-1704
*1011	Head Tank	V-5
*1016	Hold Tank (15 gal)	N/A
*2001	Decontamination Room Sump Pump	SP-201B
*2004	Process Pump	P-1
*2005	Process Pump	P-1A
*2011	Evaporator Discharge Jet	J-6
*2015	Hold Tank (15 gal) Vacuum Pump	N/A
*2017	Pump Room Sump Jet	J-5
*2018	Evaporator Pit Sump Jet	J-4
*3021a	TAN-607 Decontamination Room Sump Discharge Line[a]	2" WDA-10027
*3021c	TAN-607 Decontamination Room Sump Discharge Line	2" WDA-10027
*3022	TAN-607 Decontamination Room Sump Discharge Line (TAN-666 Construction Cross-Tie)	N/A
*3029b	Replacement Valve Pit #2 – Valve Pit #1 Drainline	4" WDA-10023

Table 4-1. (continued.)

Reference Number	Description	INEEL Unit Number
*3029c	Replacement Valve Pit #2 – Valve Pit #1 Drainline	4” WDA-10023
*3032a	Valve Pit #1 – Sump Tank (V-9) Drainline	3” A2-101
*3032b	Valve Pit #1 – Sump Tank (V-9) Drainline	3” A2-101
*3033a	Valve Pit #1 – Sump Tank (V-9) Drainline	6” A2-102
*3033b	Valve Pit #1 – Sump Tank (V-9) Drainline	6” A2-102
*3034b	Sump Tank (V-9) – TAN-616 Drainline[a]	6” A2-104
*3037a	Collecting Tank (V-1) Feed Line[a]	6” A2-104
*3038a	Collecting Tank (V-2) Feed Line[a]	6” A2-104
*3039a	Collecting Tank (V-3) Feed Line[a]	6” A2-104
*3040b	Collecting Tank (V-1) Suction Line[a]	4” A2-105
*3041b	Collecting Tank (V-2) Suction Line[a]	4” A2-105
*3042b	Collecting Tank (V-3) Suction Line[a]	4” A2-105
*3043	Process Pump Inlet Header	4” A2-105
*3044	Process Pump Discharge Line/Collecting Tank Return Line	N/A
*3045a	Collecting Tank (V-1) Return Line[a]	4” A2-106
*3046a	Collecting Tank (V-2) Return Line[a]	4” A2-106
*3047a	Collecting Tank (V-3) Return Line[a]	4” A2-106
*3048	Head Tank (V-5) Charge Line[a]	3” A2-107
*3049	Head Tank (V-5) Overflow Line[a]	4” A2-118/4” A2-117/4” A2-119
*3050	Head Tank (V-5) Discharge Line	2” A2-108
*3059	TAN-616 Evaporator (V-7) Bottoms Discharge Header[a]	4” A2-123
*3070a	Vacuum System Pump Priming Line[a]	N/A
*3070b	Vacuum Pump Inlet Line	N/A
*3070c	Vacuum Pump Drainline	N/A
*3071	Floor Sink Drainline[a]	N/A
*3079	Pump Room Sump Discharge Line	1” A2-901
*3080	Evaporator Pit Sump Discharge Line[a]	1” A2-901
*3081	TAN-616 Sump Discharge Header[a]	2” A2-901
*3098	Evaporator Header Return Line	2” A2-120
*3099	Evaporator Bypass Line	4” A2-122
N/A	New 2” Piping in TAN-616	N/A
N/A	New Transfer Pumps	N/A
N/A	Lead Sheets	N/A

a. A portion or portions of this line may require decontamination as described in Section 4.1.2.2.

4.1.2 Standard 2

- Standard 2: The owner or operator must close the facility in a manner that controls, minimizes or eliminates to the extent necessary to protect human health and the environment, post-closure escape of hazardous waste, hazardous constituents, leachate, contaminated runoff, or hazardous waste decomposition products to the ground or surface waters or to the atmosphere (IDAPA 58.01.05.009 [40 CFR 265.111 (b)]).

The activities required to minimize or eliminate to the extent necessary to protect human health and the environment, post-closure escape of hazardous waste, hazardous constituents, leachate, contaminated runoff, or hazardous waste decomposition products to the ground or surface waters or the atmosphere are:

1. Remove waste inventory (addressed under Standard 1).

2. Remove to the extent possible all system components (addressed under Standard 1).

3. Decontaminate steel components that will not be removed.

4. Decontaminate concrete components that will not be removed.

4.1.2.1 Decontamination Strategy. In general, components will be removed wherever possible in lieu of decontamination. Components that will require decontamination include both steel piping and concrete structural components. There are two categories of steel pipe sections that will require decontamination:

1. Short embedded piping stubs within the TAN-616 and TAN-607 building structures

2. TAN-607 decontamination room inlet piping and possibly direct-buried outlet piping associated with this sump.

Short embedded piping stubs within TAN-616 and TAN-607 will be decontaminated and visually inspected to ensure that no waste-related residuals or staining remain. Because these short piping stubs are accessible and it will be possible to visually inspect the decontaminated lines, it is unnecessary to define action levels for these pipe stubs. The performance standard criteria for decontamination of the TAN-616 and TAN-607 piping stub internal surfaces will be decontamination to remove all visible waste-related staining.

Inlet piping requiring decontamination associated with the TAN-607 decontamination room sump and possibly direct-buried outlet piping will be: (1) rinsed with water to remove any residual material, (2) final rinsates will be sampled and analyzed for TAN-607 decontamination room-specific contaminants of concern (COCs), and (3) the analytical data compared with TAN-607 decontamination room-specific action levels to demonstrate successful decontamination of the piping.

A visual integrity evaluation will be performed for direct-buried piping to be decontaminated (e.g., the TAN-607 decontamination room discharge piping, if necessary) to assess the potential for release to the subsurface as a result of previous operational activities and to minimize the potential for release during closure decontamination activities. The evaluation will be completed by inspecting a representative portion of the line on either side of the segment to be decontaminated at the time of its removal. The results of the inspection of the removed segment of line will be applied to the segment undergoing decontamination, provided that the portion of line to be decontaminated is not equipped with devices such as elbows, valves, or flanges that would cause the integrity of this portion to be different from the portions of lines that will be removed. If the integrity of the line segment to be decontaminated cannot be conclusively determined by visual inspection of the segments on either side, more rigorous integrity evaluation techniques, such as positive pressure testing, internal video inspection, or other suitable methods will be employed to verify that the buried segment of piping is intact. The results of the integrity evaluation will be included in the PE certification of successful HWMA/RCRA closure of the tank system. Soil associated with piping that passes the integrity evaluation will not undergo sampling. If the integrity evaluation indicates that there may have been a release from the segment of line to be decontaminated, the soils will be sampled as specified in the Field Sampling Plan (FSP) (INEEL 2003) and the soils associated with this line will be addressed as discussed in Section 4.1.3.

Concrete structural components will be decontaminated using surface abrasion, liquid rinse, or other suitable techniques to remove visible waste-related staining and visually inspected to ensure no visible waste-related staining remains. Once the visible, waste-related staining has been removed, concrete structures that are to remain in place will be sampled to develop data to complete a risk assessment for the concrete structure. The risk assessment will be completed in accordance with *Risk Assessment Guidance for Superfund, Volume I, Human Health Evaluation Manual (Part A)* (EPA 1989). Allowable risk and hazard quotient for purposes of successful completion of decontamination are excess cancer risk of 1.0E-06 and a hazard quotient of 1.

For both structural concrete components and steel components that will not be removed under closure, successful completion of decontamination to the specified closure performance standard criteria will result in the removal of any listed HWNs from these components.

Decontamination will also be required for closure equipment (i.e., tools, heavy equipment, etc.) that has come into contact with hazardous waste and that will be reused. Only equipment that will have come into direct contact with hazardous waste will require decontamination for hazardous constituents. Project logs will be maintained that document all equipment that has contacted hazardous waste. The exterior surface of equipment will be decontaminated to display a clean visible surface prior to being reused. The method and result of decontamination of all equipment will be documented and maintained as part of the project record. Decontamination residue will be managed based on an applicable hazardous waste determination and managed in accordance with Section 4.2.

4.1.2.2 Decontaminate Steel Components. Steel components will either be removed or undergo decontamination. The decontamination standard will either be removal of visible waste-related staining for piping that can be visually inspected or attainment of final rinsate action levels for piping that cannot be visually assessed. Specific subsets of steel piping to undergo decontamination are addressed below.

<u>Short Embedded Pipe Stubs within TAN-616 and TAN-607</u>. A list of short embedded pipe stubs within TAN-616 and TAN-607 structural concrete that will require decontamination to the remove visible waste-related staining criteria is included in Table 4-2. This piping will be comprised of pipe stubs approximately 2 to 5 ft in length that (following removal of accessible portions of line) will remain embedded in the concrete structures of TAN-616 and TAN-607. This equipment cannot be removed without impacting the structural integrity of the TAN-616 and TAN-607 buildings. Each of these sections of line will be decontaminated to remove visible waste-related staining using typical surface decontamination techniques (swabbing, wiping, scouring, etc.). Removal of visible waste-related staining will be confirmed by visual inspection.

Table 4-2. Short embedded pipe stubs within TAN-616 and TAN-607 concrete structures that will require decontamination to the remove visible waste-related staining.

Reference Number	Description	Location of Embedded Portion	INEEL Unit Number
*3021a	TAN-607 Decontamination Room Sump Discharge Line	TAN-607 Decontamination Room west wall	2” WDA-10027
*3034b	Sump Tank (V-9) – TAN-616 Drainline	Pump room east wall	6” A2-104
*3037a	Collecting Tank (V-1) Feed Line	Pump room east wall	6” A2-104
*3038a	Collecting Tank (V-2) Feed Line	Pump room east wall	6” A2-104
*3039a	Collecting Tank (V-3) Feed Line	Pump room east wall	6” A2-104
*3040b	Collecting Tank (V-1) Suction Line	Pump room east wall	4” A2-105
*3041b	Collecting Tank (V-2) Suction Line	Pump room east wall	4” A2-105
*3042b	Collecting Tank (V-3) Suction Line	Pump room east wall	4” A2-105
*3045a	Collecting Tank (V-1) Return Line	Pump room east wall	4” A2-106
*3046a	Collecting Tank (V-1) Return Line	Pump room east wall	4” A2-106
*3047a	Collecting Tank (V-3) Return Line	Pump room east wall	4” A2-106
*3048	Head Tank (V-5) Charge Line	Evaporator pit/pump room common wall	3” A2-107
*3049	Head Tank (V-5) Overflow Line	Evaporator pit/pump room common wall	4” A2-118/4” A2-117/4” A2-119
*3059	TAN-616 Evaporator Bottoms Discharge Header	Evaporator pit west wall	4” A2-123
*3060a	TAN-616 Evaporator Bottoms Discharge Line[a]	4” HDA-10034	*3060a
*3061a	TAN-616 Evaporator Bottoms Discharge Line[a]	4” HDA-10033	*3061a
*3070a	Blue Pump Prime Line	Floor/ceiling between the pump room and operating pump room	N/A
*3071	Floor Sink Drainline	Floor/ceiling between the pump room and operating pump room	N/A
*3080	Evaporator Pit Sump Discharge Line	Evaporator pit/pump room common wall	1” A2-901
*3081	TAN-616 Sump Discharge Header	Pump room east wall	2” A2-901

a. These lines, while not embedded in the TAN-616 structural concrete, are extensions of line 4” A2-123 [*3059] and extend from the west exterior wall of the building several feet to the point at which they were cut and capped in 1983. These small sections of line will be decontaminated along with the embedded portion of line 4” A2-123 [*3059] in lieu of removal.

TAN-607 Decontamination Room Sump Embedded Inlet and Direct-Buried Discharge Piping. A list of piping ancillary to the decontamination room sump that requires decontamination by rinsing is provided in Table 4-3.

Piping listed in Table 4-3 will be decontaminated by rinsing until final rinsate COCs concentrations are below specified TAN-607 decontamination room action levels. The rinsing of steel piping specified in Table 4-3, which excludes the portions of line 2” WDA-10027 that will have been removed in accordance with Section 4.1.2.1 and the portion embedded in the TAN-607 wall that will be decontaminated to remove visible, waste-related staining and visually inspected, will consist of flushing water through the piping, ensuring the inner surface of the line that contacted waste is contacted by water. Once the line has been decontaminated, samples of the final aqueous rinsate solution will be collected in accordance with the FSP (INEEL 2003). Collection of rinsates samples to verify that the piping meets the performance standard is addressed as Subunit 3 in the FSP. The rinsate samples will be analyzed for all COCs and compared to action levels developed for piping and components associated with the TAN-607 Decontamination Room.

Table 4-3. Piping ancillary to the decontamination room sump that will require decontamination by rinsing.

Reference Number	Description	INEEL Unit Number
*3020	TAN-607 Decontamination Room Waste Collection Piping	N/A
*3021a	TAN-607 Decontamination Room Sump Discharge Line[a]	2” WDA-10027

a. Direct-buried segments of line for which removal is impracticable due to proximity with other structures. This may include, at a minimum, the line segment beneath the foundation of TAN-660.

TAN-607 Decontamination Room-specific COCs and action levels are presented in Table 4-4. A detailed discussion of the identification of COCs and development of action levels is included in Appendix A. Action levels were developed using a risk-based back-calculation method, in which an allowable excess cancer risk and hazard quotient consistent with EPA guidance (EPA 1989) were selected. Action levels from COCs were determined that would result in excess cancer risk and hazards below the allowable threshold (excess cancer risk less than 1.0E-06 and hazard quotient less than 1). The calculated decontamination room-specific action levels apply to only steel piping that managed TAN-607 decontamination room sump waste. The calculations presented in Appendix A are separate from the risk assessments that will be performed for concrete and soil, which will be performed in accordance with EPA guidance (EPA 1989).

It is appropriate to use data from the sampling of the decontamination room sump for purposes of identification of COCs and action levels for steel piping that only managed this waste stream. The decontamination room-specific COCs and action levels identified in Table 4-4 apply to only that piping that solely managed waste from the decontamination room and was not co-mingled with waste from other sources. If the final rinsate analytical data indicates that the action levels specified in Table 4-4 have not been met, or if further decontamination of the piping is deemed impracticable, the equipment will be removed.

Table 4-4. TAN-607 Decontamination Room-specific contaminants of concern and action levels.

Contaminant of Concern	Action Level (mg/L)	Total Risk	Total Hazard Quotient
Barium	87.59	—	6.13E-04
Cadmium	0.93	2.34E-12	9.05E-04
Chromium	4.51	5.24E-10	7.35E-04
Copper	1273.55	—	1.68E-02
Lead	4.00	—	—
Mercury	0.18	—	2.88E-04
Nickel	936.34	—	2.29E-02
Silver	4.68	—	4.58E-04
Zinc	3626.41	—	5.91E-03
Cyanide (Total)	31.21	—	7.63E-04
1,1-Dichloroethene	0.10	1.10E-08	5.68E-06
1,2-Dichlorobenzene	283.75	—	1.54E-03
1,2-Dichloroethene	132.42	—	6.47E-03
1,3-Dichlorobenzene	49.66	—	2.70E-02
1,4-Dichlorobenzene	6.28	2.64E-08	1.02E-04
2-Butanone	183.16	—	1.49E-04
Dichlrorodifluoromethane	296.10	—	7.24E-04
Ethylbenzene	209.37	—	1.02E-03
Methylene Chloride	11.23	1.47E-08	9.15E-05
Tetrachloroethene	0.61	5.55E-09	2.98E-05
Toluene	493.49	—	1.21E-03
Trichloroethene	0.46	8.93E-10	3.78E-05
1,2,4-Trichlorobenzene	662.09	—	3.24E-02
Acenaphthene	1621.78	—	1.32E-02
Benzo(a)anthracene	1.14	1.45E-07	—
Benzo(a)pyrene	0.29	3.68E-07	—
Benzo(b)fluoranthene	1.14	1.45E-07	—
Butylbenzylphthalate	2960.95	—	7.24E-03
Chrysene	11.38	1.45E-08	—
Diethylphthalate	5921.91	—	3.62E-03
Di(n)octylphthalate	936.34	—	2.29E-02
Fluoranthene	1324.18	—	1.62E-02
Fluorene	1324.18	—	1.62E-02
Naphthalene	156.06	—	3.82E-03
Phenol	5128.52	—	4.18E-03
Pyrene	1146.77	—	1.87E-02
Total		7.32E-07	2.26E-01

Once the final rinsate analytical data indicate that the decontamination room-specific action levels have been achieved, the decontaminated piping within TAN-607 will be isolated. The collection piping drain assemblies will be capped or plugged within the decontamination room. As shown on Schematic P-CLOS-NEW-TAN-008-616B (Figure 1-2), there are a total of four input points to the collection piping. The piping discharge [*3020] to the decontamination room sump [*1001] will be plugged or capped. The pipe [*3021a] exiting the decontamination room sump will be plugged or capped. The pipe stub exiting TAN-607 has been historically capped outside the west of the building wall. The remainder of this line will have been removed in accordance with Section 4.1.1.2. Isolation of the piping embedded in the TAN-607 structural concrete will prevent future accumulation of waste.

4.1.2.3 Decontaminate Concrete Structures. The concrete structural components that require decontamination are listed in Table 4-5. All concrete components listed in Table 4-5 that are to remain in place will be decontaminated and sampled to verify that the concrete remaining after closure poses no threat to human health.

The TAN-615 east pit/sump [*1010] was addressed as an interim action under the VCO as specified in EDF-2167. The east pit/sump was decontaminated to remove visible staining and was sampled under a separate field sampling plan (INEEL 2002). The lower portions of the sump were scabbled to remove staining. Other portions of the pit/sump were scabbled and wiped, or other physical/abrasive methods were used as appropriate to remove visible staining. The decontamination residue was disposed of as specified in Section 4.2 of this closure plan. The TAN-615 building, along with the east pit/sump, was then subsequently removed as a D&D activity. As the remaining concrete structure of TAN-615 has been removed and no concrete comprising the east pit/sump remains, no risk assessment will be completed related to the TAN-615 concrete.

The TAN-616 pump room floor and the evaporator pit floor and walls, as well as the associated sumps within each room, will be decontaminated using a surface abrasion, liquid decontamination, or other suitable technique to remove visible waste-related staining. The TAN-607 decontamination room sump [*1001] will similarly be decontaminated to remove visible waste-related staining. Once visible waste-related staining has been removed, the remaining concrete structure in each of these areas will be sampled.

Provisions for collection of concrete samples from the TAN-607 decontamination room sump, the TAN-616 evaporator pit, and the TAN-616 pump room are included in the FSP (INEEL 2003). Collection of concrete samples after completion of decontamination from the TAN-616 pump room and evaporator pit to verify that the structures remaining after closure do not pose a threat to human health is addressed as Subunit 1 in the FSP. Collection of concrete samples from the TAN-607 decontamination room sump to verify that this structure meets the performance standard is addressed as Subunit 5 in the FSP. The floors of both the TAN-616 pump room and evaporator pit were cored and the concrete was sampled in 1994. The data resulting from this effort may be used to supplement the samples collected under the FSP. Data generated from the sampling of the TAN-616 concrete and the TAN-607 decontamination room sump will be used to complete the risk assessment of these concrete structures.

Analytical data from concrete sampling will be used to verify that concrete, following completion of decontamination, does not pose a threat to human health. For purposes of this HWMA/RCRA closure plan, the risk and hazard thresholds are less than 1.0E-06 excess residual cancer risk and hazard quotient less than 1.

The risk assessments for the concrete structures will be completed in accordance with EPA guidance (EPA 1989) using site-specific parameters and an industrial exposure scenario. Should the concrete pose an excess increase in cancer risk due to HWMA/RCRA-regulated constituents of greater than 1.0E-06 or a hazard quotient greater than 1.0, further decontamination will be completed until it is determined that the remaining concrete does not pose a risk to human health.

Table 4-5. Concrete structural components that will require decontamination.

Reference Number	Description	INEEL Unit Number
*1010	TAN-615 East Pit/Sump[a]	98TAN00409
*1020	TAN-616 Pump Room Sump and Pump Room Floor	98TAN00651
*1021	TAN-616 Evaporator Pit Sump and Evaporator Pit Floor/Walls	98TAN00419
*1001	TAN-607 Decontamination Room Sump	01TAN00001
*2014	TAN-616 Operating Pump Room Floor Sink	N/A

a. Decontamination of the TAN-615 east pit/sump concrete has been completed as an interim action under the VCO. As the decontaminated concrete structure of TAN-615 has been removed, no risk assessment will be completed for this concrete.

4.1.3 Standard 3

- Standard 3: The owner or operator must close the facility in a manner that complies with the closure requirements of this subpart, including, but not limited to, the requirements of 40 CFR 265.197, 265.228, 265.258, 265.280, 265.310, 265.351, 265.381, 265.404, and 264.1102 (IDAPA 58.01.05.009 [40 CFR 265.111 (c)]).

As the ILRW Treatment Subsystem is a tank system, it is subject to the closure requirements specified at 40 CFR 265.197. The tank system closure requirements [as quoted from IDAPA 58.01.05.009 (40 CFR 265.197)] are:

1. At closure of a tank system, the owner or operator must remove or decontaminate all waste residuals, contaminated containment system components (liners, etc.), contaminated soils, and structures and equipment contaminated with waste, and manage them as hazardous waste, unless §261.3(d) of this Chapter applies. The closure plan, closure activities, cost estimates for closure, and financial responsibility for tank systems must meet all of the requirements specified in subparts G and H of this part (IDAPA 58.01.05.009 [40 CFR 265.197 (a)]).

2. If the owner or operator demonstrates that not all contaminated soils can be practicably removed or decontaminated as required in paragraph (a) [Requirement 1] of this section, then the owner or operator must close the tank system and perform post-closure care in accordance with the closure and post-closure care requirements that apply to landfills (§265.310). In addition, for the purposes of closure, post-closure, and financial responsibility, such a tank system is then considered to be a landfill, and the owner or operator must meet all of the requirements for landfills specified in subparts G and H of this part (IDAPA 58.01.05.009 [40 CFR 265.197 (b)]).

3. If an owner or operator has a tank system which does not have secondary containment that meets the requirements of §265.193 (b) through (f) and which is not exempt from the secondary containment requirements in accordance with §265.193(g), then,

   (a) The closure plan for the tank system must include both a plan for complying with paragraph (a) [Requirement 1] of this section and a contingent plan for complying with paragraph (b) [Requirement 2] of this section.

(b) A contingent post-closure plan for complying with paragraph (b) [Requirement 2] of this section must be prepared and submitted as part of the permit application.

(c) The cost estimates calculated for closure and post-closure care must reflect the costs of complying with the contingent closure plan and the contingent post-closure plan, if these costs are greater than the costs of complying with the closure plan prepared for the expected closure under paragraph (a) [Requirement 1] of this section.

(d) Financial assurance must be based on the cost estimates in paragraph (c)(3) [Requirement 3c] of this section.

(e) For purposes of the contingent closure and post-closure plans, such a tank system is considered to be a landfill, and the contingent plans must meet all of the closure, post-closure, and financial responsibility requirements for landfills under subparts G and H of this part (IDAPA 58.01.05.009 [40 CFR 265.197 (c)]).

4.1.3.1 Plan for Closure in Compliance with §265.197(a) [Requirement 1]. The activities required to close the tank system in accordance with 40 CFR 265.197(a) are:

1. Remove waste inventory (addressed under Standard 1).

2. Remove to the extent possible all system components (addressed under Standard 1).

3. Decontaminate steel components that will not be removed (addressed under Standard 2).

4. Decontaminate concrete components that will not be removed (addressed under Standard 2).

5. Sample soils associated with direct-buried components that have been determined to have managed hazardous waste following component decontamination or removal to characterize potential soil contamination. The resulting characterization will be used differently depending upon whether the soils are located within an established FFA/CO site or not.

<u>Soils within established FFA/CO sites</u>. Two FFA/CO sites have been identified that include soils associated with equipment undergoing closure. These sites are shown on Schematic P-CLOS-NEW-TAN-008-616B (Figure 1-2) and include:

- TSF-09/18: Location surrounding the collecting tanks (V-1, -2, and -3) [*1006, *1007, and *1008] and the sump tank (V-9) [*1004] – buried hazardous waste management piping addressed in this closure plan is located within the area of contamination for this site.

- TAN-616: Soils beneath and surrounding TAN-616.

Soils associated with components undergoing closure that are included within the boundaries of one of the established FFA/CO sites, as shown on Schematic P-CLOS-NEW-TAN-008-616B (Figure 1-2), will be subject to characterization under HWMA/RCRA closure once decontamination or removal of these components is completed. Remedial investigation and/or remedial activities with respect to these soils will be completed under the provisions of the FFA/CO. Completion of these FFA/CO activities will not be a criterion for closure certification. Provisions for sampling and analysis of these soils under HWMA/RCRA closure are included as Subunit 2 in the FSP (INEEL 2003).

Line 2” WDA-10027 [*3021a and *3021c], the TAN-607 decontamination room sump discharge line, passes beneath two surficial soil contamination sites (not shown on Schematic P-CLOS-NEW-TAN-008-616B [Figure 1-2]) that are identified on the FFA/CO:

- TSF-06 (Area 11) – Ditch
- TSF-06 (Area B) – Soil Area South of Turntable.

The contamination zone for these two sites is defined as 0.5 ft deep and 2.5 ft deep, respectively (DOE-ID 1997). This waste line is buried at a depth of approximately 5 ft (Paige 1972). Because these sites are surficial contamination sites and are not related to the buried waste line, the soils beneath the line that is to be removed from within these FFA/CO sites will be characterized as part of this closure and managed as described below (i.e., characterized as though they are not within an established FFA/CO site). As the contaminated surficial soils are unrelated to the equipment undergoing closure, and are being managed under the provisions of the FFA/CO, no remedial activities related to the known surficial soil contamination will be conducted under closure.

Soils outside established FFA/CO Sites. Soils remaining in place upon completion of equipment removal or decontamination activities that are associated with hazardous waste management components addressed in this closure that are not located within the boundaries of one of the established FFA/CO sites, as shown on Schematic P-CLOS-NEW-TAN-008-616B (Figure 1-2), will be characterized as specified in an approved field sampling plan. Contaminated soils may be removed during closure activities. Data from soils outside established FFA/CO sites will be used to complete a risk assessment, conducted in accordance with EPA guidance (EPA 1989), which will demonstrate that the soils do not pose a threat to human health or the environment (e.g., excess cancer risk less than 1.0E-06 and hazard quotient less than 1). If soil contamination remains at the completion of closure activities that poses a threat to human health or the environment, the soil will be addressed as described in Section 4.1.3.2.

Due to historical operations at TAN, there is a possibility that soil contamination unrelated to operation of the ILRW Management System may be detected, based either on analytical results or field observations. Only soil that has been contaminated as a result of a release from the ILRW Treatment Subsystem will be addressed under this closure plan. The assessment of the source of any detected soil contamination will be completed based upon proximity of other unrelated equipment or components and the integrity of the components subject to closure activities. Any historical contamination discovered that is unrelated to the system undergoing closure will be addressed using the FFA/CO New Site Identification process; however, approval of the new site by the agencies is not a criterion for certification of closure.

Cost Estimates and Financial Responsibility. Cost estimates and demonstration of financial responsibility requirements are not applicable to the ILRW Treatment Subsystem closure, as the tank system is owned by the federal government and is exempt per IDAPA 58.01.05.009 [40 CFR 265.140(c)].

4.1.3.2 Plan for Closure in Compliance with 40 CFR 265.197(b) and (c) [Requirements 2 and 3]. Soils located within established FFA/CO sites will be evaluated, as specified above, as part of the remedial investigation and/or remedial activities for the site under the provisions of the FFA/CO. Soils remaining in place after removal or decontamination of components requiring closure activities that are not located within the boundaries of one of the established FFA/CO sites, as shown on Schematic P-CLOS-NEW-TAN-008-616B (Figure 1-2), will be characterized as specified in the FSP (INEEL 2003). Should soil contamination be detected, the soils will be evaluated using a risk assessment, completed in accordance with EPA guidance (EPA 1989). If the risk assessment indicates soil contamination is present that poses a threat to human health, a New Site Identification under the FFA/CO will be completed to allow investigation of the contaminated soil under CERCLA. Approval of this New Site Identification form by the agencies, including IDEQ and EPA, is a criterion for certification of closure. Completion of remedial investigation for these potential new sites under the FFA/CO is not a criterion for certification of closure. If the New Site Identification form is not approved by the agencies, this plan will be amended in accordance with Section 6 to include provisions for closure and post-closure care requirements that apply to landfills (40 CFR 265.310) and will be resubmitted, in accordance with 40 CFR 265.197(c)(2), as part of the post-closure permit application.

Per EDF-2167, the soils beneath the TAN-615 east pit/sump (98TAN00409 [*1010]) have been sampled and a new site identification form completed for residual contamination associated with these soils. Upon approval of the new site identification form, the TAN-615 sumps will be moved to Appendix C of the VCO – Covered Matters that are Closed. Should the new site identification addressing these soils be disapproved by the agencies, a risk assessment will be completed for the residual soil contamination and soils managed as necessary under the provisions of this closure plan.

4.2 Waste Management

A variety of waste streams will be generated during HWMA/RCRA partial closure of the ILRW Treatment Subsystem. Primary waste streams will include the current waste inventory contained within the system as specified in Table 3-1 of this closure plan, the components that are to be removed, and decontamination residue. Closure-derived waste streams will also consist of items such as contaminated personal protective equipment (PPE), sampling equipment, and tools. All waste generated during this closure project, as specified in Table 4-6, will be considered closure-derived waste. Details as to how specific waste streams will be managed in accordance with applicable 40 CFR 262.34 standards are provided in Table 4-6.

Table 4-6. Closure-derived waste streams and disposal pathways.

Waste Stream	Description	Expected EPA Hazardous Waste Number	Disposal Pathway
Process Waste	Evaporator pit sediment	F001, D006, D008	Storage at INTEC-1617 or other INEEL HWMA/RCRA-permitted facility until disposal path is confirmed
Process Waste	Head tank sediment	F001	Storage at INTEC-1617 or other INEEL HWMA/RCRA-permitted facility until disposal path is confirmed
Process Waste	Pump room sediment	F001, D008, D009	Storage at INTEC-1617 or other INEEL HWMA/RCRA-permitted facility until disposal path is confirmed
Process Waste	TAN-615 East pit/sump sediment	D006, D008	Interim Storage at INTEC-1617 prior to off-Site stabilization and disposal at a permitted RCRA treatment storage and disposal facility[a,b]
Process Waste	Decontamination room sump liquid	F001, D008, D009	Storage at INTEC-1617 or other INEEL HWMA/RCRA-permitted facility until disposal path is confirmed
Process Waste	Valve Pit #1 liquid	F001	Storage at INTEC-1617 or other INEEL HWMA/RCRA-permitted facility until disposal path is confirmed
Equipment	Components and lead shielding listed in Table 4-1 that will be	F001[a]	Storage at INTEC-1617 or other INEEL HWMA/RCRA-permitted facility until disposal path is confirmed

Table 4-6. (continued.)

Waste Stream	Description	Expected EPA Hazardous Waste Number	Disposal Pathway
	removed under closure		
Soils (if applicable)	Soils associated with direct-buried components that may be removed during component removal activities	TBD	To be determined based upon waste stream characterization
Decontamination Residue	Waste resulting from the decontamination of concrete structures and TAN-616 embedded piping	TBD[b]	To be determined based upon waste stream characterization
Decontamination Residue	Spent decontamination solutions resulting from decontamination of steel components	TBD[b]	To be determined based upon waste stream characterization
Secondary waste	Disposable closure equipment (PPE, sampling equipment, etc.)	TBD[b]	To be determined based upon waste stream characterization

a. Lead shielding will, upon removal from the evaporator pit, display the EPA HWN for toxicity for lead (D008).

b. This waste stream will be characterized for disposal and appropriate EPA HWNs applied. The disposal pathway for this waste stream will be determined based upon the characterization results. The concrete decontamination residue from decontamination of the TAN-615 east pit/sump has been disposed along with the sediment removed from the pit/sump

The 90-day timeframe stipulated in IDAPA 58.01.05.006 [40 CFR 262.34(a)(1)] will not apply to closure-derived waste staged within the demarcated closure area while closure activities are being conducted. All other 262.34(a) requirements will be met. All waste and waste containers will be removed from the demarcated closure area and transferred to RCRA-permitted or interim status storage prior to closure certification. Information regarding waste management during closure activities will be provided to the independent PE for closure certification.

Closure-derived waste will be dispositioned based upon applicable HWDs.

Decontamination residues (i.e., liquids, rags, etc.) resulting from activities associated with listed waste will be managed as a listed waste and undergo a characteristic HWD evaluation. Decontamination residues from components that only managed waste displaying a hazardous characteristic will undergo a characteristic HWD evaluation. Waste will be disposed in accordance with the results of the HWD for this waste stream.

5. CLOSURE SCHEDULE

IDAPA 58.01.05.009 [40 CFR 265.113(a) and 113(b)] specifies time limits for submitting closure plans, beginning closure, and the removal of all waste from a tank system. The INEEL is requesting an extension to these requirements because waste removal will, of necessity, take longer than 90 days and completion of closure will, of necessity, take longer than 180 days.

Table 5-1 identifies the schedule for performing and completing the closure activities specified in this plan. This schedule reflects the time required for conducting closure activities and submitting information to the PE for the closure certification. If closure activities are completed ahead of schedule, the INEEL will accelerate the closure certification process accordingly.

Day 0, as specified in Table 5-1, is the date of receipt of approval of the closure plan. The removal and disposition of some components as described in Section 4.1.1 of this closure will have occurred prior to the submittal and approval of this closure plan (Day 0). Since removal of wastes and equipment are the most protective measures possible, the closure methods for this equipment are not expected to change as a result of review and approval of the closure plan. Consequently, activities that may occur prior to Day 0 will be consistent with the approved closure plan. Any specified activity may be completed ahead of the schedule shown in support of final facility closure.

Table 5-1. Schedule for closure of the ILRW Treatment Subsystem.

Planned Work Tasks	Days to Completion
IDEQ approval of closure plan	Day 0
Complete removal of evaporator pit equipment	Day 180
Each of the following completed: • Complete removal of hazardous waste inventory as specified in Table 3-1 from the specified components • Complete TAN-616 evaporator pit decontamination • Complete removal buried piping and Valve Pit #1 • Complete TAN-607 decontamination room sump decontamination • Complete removal of remaining pump room piping	Day 400
Each of the following completed: • Complete soil and rinsate sampling for piping removal and decontamination • Complete TAN-616 pump room decontamination • Complete concrete sampling	Day 430
Complete closure-generated waste disposition	Day 520
Closure activities complete	Day 520
Professional Engineer and owner/operator certification submitted to IDEQ	Within 60 days of completion of closure activities

IDAPA 58.01.05.009 (40 CFR 265.113) requires waste removal activities to be complete 90 days from the approval of the closure plan and closure to be complete within 180 days from the initiation of the closure. An extension to these time periods, as specified in Table 5-1, is being requested at this time, pursuant to IDAPA 58.01.05.009 (40 CFR 265.113). Waste removal and closure activities cannot be completed within these timeframes due to:

- Elevated radiation fields and INEEL requirements for keeping worker radiation exposure as low as reasonably achievable
- Care in work planning to ensure no future release to the environment
- Proximity and integration with the ILRW Feed and Holding Tank Subsystems
- Proximity of ancillary equipment to a variety of TAN structures, including TAN-607
- Difficulties accessing and removing equipment from the TAN-616 evaporator pit
- Complexity associated with closure activities, including removal of components from within established FFA/CO sites, removal of components adjacent to buildings without impacting the structural integrity of these buildings, decontamination of concrete surfaces in several buildings, and the difficulties associated with packaging, staging, and transporting MLLW.

6. CLOSURE PLAN AMENDMENTS

The conditions described in IDAPA 58.01.05.009 (40 CFR 265.112), will be followed to implement changes to the approved closure plan. Should unexpected events during the closure period require modification of the approved closure activities or closure schedule, the closure plan will be amended within 30 days of the unexpected event. A written request detailing the proposed changes and the rationale for those changes and a copy of the amended closure plan will be submitted for IDEQ approval. Minor changes to the approved closure plan, which are equivalent to or do not compromise the closure requirements and performance standards identified in the approved closure plan, may be made without prior notification to IDEQ. Minor changes will be identified in the documentation supporting the independent PE certification.

7. CERTIFICATION OF CLOSURE

This partial closure plan is one of three plans that will be used to complete HWMA/RCRA closure of the ILRW Management System. This partial closure plan will be the first of three phases that will result in closure of the ILRW Management System. The three subsystems that will undergo partial closure are:

1. Phase I: Treatment Subsystem (TAN-616)

2. Phase II: Feed Subsystem (Tanks V-1, -2, -3, and -9)

3. Phase III: Holding Tank Subsystem (PM-2A Tanks).

Final facility closure of the ILRW Management System will be complete when all three identified partial closure phases are complete. This partial closure plan provides for closure of the ILRW Treatment Subsystem. Separate closure plans will be prepared for the ILRW Feed and Holding Tank Subsystems.

Within 60 days of completing the closure activities specified in this partial closure plan, a closure certification of the subsystem will be provided, in accordance with IDAPA 58.01.05.009 (40 CFR 265.115), by an independent PE to the INEEL operating contractor and the U.S. Department of Energy (DOE) Idaho Operations Office. The certification of closure will be submitted as a milestone deliverable under Section 9.8 of the VCO. The PE and owner/operator signatures on the closure certification, which is submitted to the IDEQ, will document the completion of closure activities in accordance with the approved closure plan and State of Idaho HWMA/RCRA requirements. The closure certification may also identify any minor changes to the closure plan made without prior approval of the IDEQ. Closure of the ILRW Treatment Subsystem will be considered complete upon receipt of written acceptance issued by the IDEQ. After final closure has been completed the independent PE will document the closure of the entire ILRW Management System and submit the documentation to the IDEQ.

Copies of documentation supporting the closure of each phase of the ILRW Management System will remain in the project files and the INEEL Environmental Affairs Administrative Record in the event that this information is requested by IDEQ. The ILRW Management System is not a hazardous waste disposal facility and, therefore, a "Notice in Deed" and a survey plat are not required.

8. COST AND LIABILITY REQUIREMENTS

The federal government, as owner of the INEEL, is exempt from the requirements to provide cost estimates for closure, to provide a financial assurance mechanism for closure, and regarding state-required mechanism and state assumption of responsibility per IDAPA 58.01.05.009 [40 CFR 265.140(c)]. The federal government, as owner of the INEEL, is also exempt from liability requirements per this same exclusion.

9. REFERENCES

40 CFR 261, 2003, "Identification and Listing of Hazardous Waste," *Code of Federal Regulations*, Office of the Federal Register, February 24, 2003.

40 CFR 262, 2002, "Standards Applicable to Generators of Hazardous Waste," *Code of Federal Regulations,* Office of the Federal Register, February 6, 2002.

40 CFR 265, 2002, "Interim Status Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities," *Code of Federal Regulations,* Office of the Federal Register, February 13, 2002.

42 USC 6901 et seq., 1976, "Resource Conservation and Recovery Act of 1976," as amended.

42 USC 9601 et seq., 1980, "Comprehensive Environmental Response, Compensation, and Liability Act of 1980," as amended. (NOTE: The 1986 amendment is cited as "Superfund Amendments and Reauthorization Act of 1986," [SARA].)

DOE-ID, 1991, *Federal Facility Agreement and Consent Order for the Idaho National Engineering Laboratory*, U.S. Department of Energy Idaho Operations Office, U.S. Environmental Protection Agency Region 10, and State of Idaho Department of Health and Welfare, Administrative Docket No. 1088-06-120, December 9, 1991.

DOE-ID, 1997, *Comprehensive Remedial Investigation/Feasibility Study for the Test Area North Operable Unit 1-10 at the Idaho National Engineering and Environmental Laboratory*, DOE/ID-10557, Revision 0, November 1997.

EDF-2167, 2002, "VCO NEW-TAN-008 Characterization – TAN-615 Pits/Sumps," Revision 0, May 2002.

EDF-2333, 2003, "VCO NEW-TAN-008 TAN-616 Liquid Waste Treatment Facility Characterization – Influent and Effluent Units and Associated Piping External to TAN-616," Revision 2, February 2003.

EDF-2793, 2001, "VCO NEW-TAN-008 TAN-616 Liquid Waste Treatment Facility Characterization," Revision 1, November 2001.

EDF-2879, 2002, "VCO NEW-TAN-008 TAN-616 Liquid Waste Treatment Facility Characterization – Interior Units," Revision 0, April 2002.

EPA, 1989, *Risk Assessment Guidance for Superfund, Volume I, Human Health Evaluation Manual (Part A)*, EPA/540/1/1-89/1002, December 1989.

Evans, T. A., and E. F. Perry, 1993, *Final Report of the Remedial Action Taken for the TAN Building 616 Liquid Waste Treatment Facility*, EGG-2714, September 1993.

Hogg, G. W., W. F. Holcomb, L. T. Lakey, L. H. Jones, and D. D. Coward, 1971, "A Survey of NRTS Waste Management Practices, Volumes I and II, ICP-1042, September 1971.

IDAPA, 58.01.05.006, 2002, "Standards Applicable to Generators of Hazardous Waste," Idaho Administrative Procedures Act, Idaho Department of Environmental Quality Rules, March 15, 2002.

IDAPA, 58.01.05.009, 2002, "Interim Status Standards for Owners and Operators of Hazardous Waste Treatment, Storage and Disposal Facilities," Idaho Administrative Procedures Act, Idaho Department of Environmental Quality Rules, March 15, 2002.

IDEQ, 2000, B. R. Monson, IDEQ, to D. N. Rasch, DOE-ID, Enclosure: "Consent Order," Idaho Code § 39-4413, June 14, 2000.

IDEQ, 2001, Gregory, D. M., to D. Wessman, VCO Project Manager, Department of Energy, July 30, 2001, "Revised Milestone Deliverable for VCO NEW-TAN-008 System Identification at the Idaho National Engineering and Environmental Laboratory (INEEL) Test Area North (TAN), EPA ID No. ID4890008952 (CCN: 24561)."

IDEQ, 2002a, Gregory, D. M., to D. Wessman, VCO Project Manager, Department of Energy, May 29, 2002, "VCO NEW-TAN-008, TAN-616 Liquid Waste Treatment Facility Characterization – Interior Units, Received April 30, 2002 at the Idaho National Engineering and Environmental Laboratory (INEEL) Test Area North (TAN), EPA ID No. ID4890008952 (CCN: 33201)."

IDEQ, 2002b, Gregory, D. M., to D. Wessman, VCO Project Manager, Department of Energy, June 27, 2002, "VCO NEW-TAN-008, TAN-615 East and West Pits/Sumps Characterization Report (Report), Received May 28, 2002 at the Idaho National Engineering and Environmental Laboratory (INEEL) Test Area North (TAN), EPA ID No. ID4890008952 (CCN: 34117)."

IDEQ, 2002c, Gregory, D. M., to D. Wessman, VCO Project Manager, Department of Energy, December 18, 2002, "VCO NEW-TAN-008, TAN-616 Liquid Waste Treatment Facility Characterization – Influent and Effluent Units and Associated Piping External to TAN-616, Received November 27, 2002 at the Idaho National Engineering and Environmental Laboratory (INEEL) Test Area North (TAN), EPA ID No. ID4890008952 (CCN: 38658)."

INEEL, 2001a, *Voluntary Consent Order NEW-TAN-008 System Identification*, "TAN-616 Liquid Waste Treatment System," INEEL/EXT-2000-01263, Revision 1, June 2001.

INEEL, 2001b, *Characterization and Decision Analysis Report for the TAN-616 Liquid Waste Treatment Facility*, INEEL/EXT-01-00029, Revision 0, May 2001.

INEEL, 2002, *Field Sampling Plan for Miscellaneous Locations at Test Area North in Support of the NEW-TAN-008 Voluntary Consent Order Project and the Decontamination and Dismantlement of TAN-616*, INEEL/EXT-01-01453, Revision 2, November 2002.

INEEL, 2003, *Field Sampling Plan for the HWMA/RCRA Closure Certification of the TAN-616 Liquid Waste Treatment Facility*, INEEL/EXT-02-00908, Revision 0, March 2003.

Kerr, W. B., 1971, *A Study of Radioactive Liquid Waste Management at Test Area North (TAN)*, ACI-101, December 1971.

Magleby, Mary T., INEEL, to David L. Wessman, DOE-ID, November 16, 2001, "Voluntary Consent Order (VCO) Conference Call Minutes," CCN: 27602.

Olaveson, B. E., J. E. Birchler, and R. C. Buttars, 1994, *Characterization and Decision Analysis for the TAN-616 Liquid Waste Treatment Facility,* BWI-1398, September 26, 1994.

Paige, B. E., 1972, *Buried Waste Line Register for NRTS Part II TAN*, ACI-108, January 1972.

Smith, D. L., 1983, *Final Report Decontamination and Decommissioning of TAN Radioactive Liquid Waste Evaporator System (PM-2A)*, EGG-2236, March 1983.

State of Idaho, 1983, "Hazardous Waste Management," Idaho Statute, Title 39, "Health and Safety," Chapter 44, "Hazardous Waste Management" (also known as the Hazardous Waste Management Act of 1983).

Appendix A

Development of Action Levels for the HWMA/RCRA Closure of Ancillary Equipment Associated with the TAN-607 Decontamination Room Sump

Appendix A

Development of Action Levels for the HWMA/RCRA Closure of Ancillary Equipment Associated with the TAN-607 Decontamination Room Sump

The ancillary equipment associated with the TAN-607 decontamination room sump (hereinafter referred to as the decontamination room piping in this appendix) is to be closed under HWMA/RCRA (State of Idaho 1983; 42 USC 6901 et seq.) by decontamination of the internal piping surfaces. Compliance with the performance standard for closure of equipment ancillary to tank systems (40 CFR 265.111 and 265.197) is to be demonstrated for the decontamination room piping by sampling the final rinsate solutions from the decontamination efforts and comparing the resulting analytical data with action levels developed in this appendix. The action levels for the HWMA/RCRA closure of decontamination room piping have been developed to ensure that the piping, subsequent to completion of closure activities, will be left in a state that is protective of human health. This appendix was prepared to present the methodology used to develop action levels specific to this piping. TAN-607 Decontamination Room-specific action levels were developed by defining the acceptable excess cancer risk and hazard quotient thresholds and calculating corresponding action levels based upon these risk and hazard thresholds. Finally, the excess cancer risk and hazard for all pathways and contaminants at the developed action levels are presented. The technique for calculation of action levels described in this appendix will be applied to any additional COCs identified during the course of closure activities for this ancillary piping.

This analysis considers two pathways: soil inhalation and soil ingestion to an occupational receptor. Performing the analysis considering these pathways is very conservative. In developing the conceptual site model for this risk assessment, the following assumptions were made:

1. Liquid infiltration contacts the internal piping surfaces

2. Contacting liquid then exits the piping with all COCs present at action level concentrations

3. Each liter of contaminated liquid contaminates 1 kg of soil (thus, each part per million of contaminant in the liquid is equivalent to one part per million of contaminant in the soil).

Assumption 1 is conservative due to the planned capping of both ends of each line, isolating the line from possible water infiltration. Once the lines and drain assemblies have been capped, it is highly unlikely that water infiltration will contact the internal piping surfaces. Assumption 2 is conservative because it assumes immediate release of liquid contacting the internal piping surfaces from the pipe to the soil. In reality, liquid contacting the internal pipe surfaces will remain contained within the stainless steel piping. Assumption 3 is conservative for three reasons. First, assuming an average bulk soil density of 1.3 kg/L, and an average soil porosity of 0.45, the void volume in a typical kilogram of soil is approximately 350 mL. Thus, although the assumption has been made that each liter of contaminated liquid contaminates 1 kg of soil, in reality, it is only physically possible for 350 mL of the contaminated liquid to contaminate each kilogram of soil. Second, it is assumed that the liquid and soil are in contact for sufficient time to allow mass transfer equilibrium to be reached between the soil column and the liquid, whereas in reality, the water would be flowing through the soil column and equilibrium will not be reached. Finally, it is assumed that 100% of the contaminant is transferred to the soil without regard for partitioning of the contaminant between the soil column and the water. In reality, a fraction of each of the contaminants will remain contained within the contaminated liquid.

Step 1: Define the Total Allowable Excess Cancer Risk and Hazard Quotient to the Future Occupational Receptor

As stated in the assumptions above, the liquid that may come into contact with the closed piping and subsequently contaminate surrounding soil is assumed to exit the piping and enter the surrounding soil at the action level concentration. The surrounding soil is then assumed to be contaminated at equivalent parts per million concentrations. Consequently, risk-based media cleanup standards are appropriate to establish the allowable excess cancer risk and hazard quotient. Protective media cleanup standards for human health means constituent concentrations that result in the total residual risk from a medium to an individual exposed over a lifetime falling within a range from 10^{-4} to 10^{-6}, with a cumulative carcinogenic risk range. For noncarcinogenic effects, EPA generally interprets protective cleanup standards to mean constituent concentration that an individual could be exposed to on a daily basis without appreciable risk of deleterious effect during a lifetime; the hazard index generally should not exceed 1 (55 Federal Register [FR] 46, 1990; 55 FR 145, 1990; 61 FR 85, 1996). To ensure protectiveness of human health, the most conservative threshold for excess cancer risk, 1.0E–06, will be used for the decontamination room piping. Therefore:

- Total allowable risk threshold = 1.0E-06
- Total allowable hazard quotient threshold = 1.0.

Step 2: Define Receptors and Pathways

The pathways considered for developing decontamination room-specific action levels include:

- Occupational receptor ingestion of contaminated soil
- Occupational receptor inhalation of contaminated soil.

Step 3: Define Contaminants of Concern and Toxicity Parameters

The COC list was developed by defining all HWMA/RCRA-regulated constituents that meet the following criterion: The HWMA/RCRA-regulated constituent was detected during sampling and analysis of the waste historically contained within the TAN-607 decontamination room sump ***and*** the constituent is listed in the United States EPA Region 9 Preliminary Remediation Goal (PRG) Table (EPA 2001a)

Data from historical sampling of the TAN-607 decontamination room sump resulting from sampling events in November 1989, March 1990, January 1991, and May 1991 were reviewed to determine COCs. Any contaminant detected in any of the four specified sampling events was retained for evaluation versus the list of applicable contaminants listed in the EPA Region 9 PRG table. Applying this criterion allows definition of the complete COC list for HWMA/RCRA closure of the decontamination room piping. The complete list of COCs is provided in Table A-1. As stated in the criterion above, detected constituents that are not listed in the EPA Region 9 PRG Table were excluded from the COC list. Constituents excluded for this reason were 2-methylnaphthalene, acenaphthylene, benzo(g,h,i)perylene, bis(2-ethylhexyl)phthalate, and phenanthrene.

Reference doses and slope factors for each of the COCs are provided in Table A-1. This information was obtained from the United States EPA Region 9 PRG Table (EPA 2001a). Toxicity information is available for all COCs listed in Table A-1 with the exception of lead. While there is no specific toxicity information currently available for lead, separate EPA guidance was used to develop the decontamination room-specific action level for lead (see Step 8).

Table A-1. COCs and associated toxicity parameters as provided in the EPA Region 9 PRG Table (EPA 2001a).

COC	Oral Slope Factor 1 (mg/Kg-d)	Oral Reference Dose (mg/Kg-d)	Inhalation Slope Factor 1 (mg/Kg-d)	Inhalation Reference Dose (mg/Kg-d)
Barium	—	7.00E-02	—	1.40E-04
Cadmium	—	5.00E-04	6.30E+00	—
Chromium	—	3.00E-03	2.90E+02	—
Copper	—	3.70E-02	—	—
Lead	—	—	—	—
Mercury	—	3.00E-04	—	8.60E-05
Nickel	—	2.00E-02	—	—
Silver	—	5.00E-03	—	—
Zinc	—	3.00E-01	—	—
Cyanide (total)	—	2.00E-02	—	8.60E-04
1,1-Dichloroethene	6.00E-01	9.00E-03	1.80E-01	9.00E-03
1,2-Dichlorobenzene	—	9.00E-02	—	5.70E-02
1,2-Dichloroethene	—	1.00E-02	—	1.00E-02
1,3-Dichlorobenzene	—	9.00E-04	—	9.00E-04
1,4-Dichlorobenzene	2.40E-02	3.00E-02	2.20E-02	2.30E-01
2-Butanone	—	6.00E-01	—	2.90E-01
Dichlrorodifluoromethane	—	2.00E-01	—	5.70E-02
Ethylbenzene	—	1.00E-01	—	2.90E-01
Methylene Chloride	7.50E-03	6.00E-02	1.60E-03	8.60E-01
Tetrachloroethene	5.20E-02	1.00E-02	2.00E-03	1.10E-01
Toluene	—	2.00E-01	—	1.10E-01
Trichloroethene	1.10E-02	6.00E-03	6.00E-03	6.00E-03
1,2,4-Trichlorobenzene	—	1.00E-02	—	5.70E-02
Acenaphthene	—	6.00E-02	—	6.00E-02
Benzo(a)anthracene	7.30E-01	—	3.10E-01	—
Benzo(a)pyrene	7.30E+00	—	3.10E+00	—
Benzo(b)fluoranthene	7.30E-01	—	3.10E-01	—
Butylbenzylphthalate	—	2.00E-01	—	2.00E-01
Chrysene	7.30E-03	—	3.10E-03	—
Diethylphthalate	—	8.00E-01	—	8.00E-01
Di(n)octylphthalate	—	2.00E-02	—	2.00E-02
Fluoranthene	—	4.00E-02	—	4.00E-02
Fluorene	—	4.00E-02	—	4.00E-02
Naphthalene	—	2.00E-02	—	8.60E-04
Phenol	—	6.00E-01	—	6.00E-01
Pyrene	—	3.00E-02	—	3.00E-02

Step 4: Define Percentage of Risk and Hazard to be Applied to Ingestion and Inhalation Scenario

The total allowable excess cancer risk and hazard quotient must be split into the fraction that is allowable for the ingestion pathway and the fraction that is allowable for the inhalation pathway. Experience indicates that the ingestion pathway will drive the risk and hazard for the occupational receptor. Consequently, the majority (99.5%) of the allowable risk and hazard defined in Step 1 above was assigned to the ingestion pathway as shown in Table A-2.

Table A-2. Pathway-specific allowable risk and hazard.

	Total	Ingestion Percentage	Inhalation Percentage	Ingestion Fraction	Inhalation Fraction
Risk	1.00E-06	9.95E-01	5.00E-03	9.95E-07	5.00E-09
Hazard Quotient	1.00	9.95E-01	5.00E-03	9.95E-01	5.00E-03

Step 5: Calculate the COC-Specific Allowable Risk and Hazard Quotient for Each Pathway

Back calculation of decontamination room-specific action levels for COCs requires determination of allowable risk for each COC.[c] The sum of all allowable risks must be less than 1.0E-06. To determine the allowable risk for each COC, the total allowable risk must be apportioned among the COCs. There are several techniques for apportioning allowable risk among COCs.

The simplest technique for apportioning allowable risk is to distribute allowable risk equally among the COCs. Using this technique, the allowable risk is divided by the total number of carcinogenic COCs and the result is used as the allowable risk for each COC. The problem with this approach is that it makes no differentiation among COCs with respect to carcinogenic threat to human health. In the case of the action level determination for the HWMA/RCRA closure of the decontamination room piping, the same allowable risk is assigned to a COC that is extremely carcinogenic (benzo(a)pyrene [slope factor 7.3 $(mg/kg\text{-}d)^{-1}$]) and a contaminant that is minimally carcinogenic (methylene chloride [slope factor 0.0075 $(mg/kg\text{-}d)^{-1}$]). Using this approach results in decontamination room-specific action levels that are extremely low (below detection levels in many instances) for the highly carcinogenic compounds and action levels that are excessively high for minimally carcinogenic compounds. This approach results in decontamination efforts being driven by the need to meet a single action level for the most carcinogenic component. The actual COC concentrations for the less carcinogenic components will be reduced far below decontamination room-specific action levels, resulting in a total residual risk far below the threshold of 1.0E-06. While extremely conservative, this approach results in action levels that may prove impossible to achieve during closure (particularly those below detection limits).

A second approach uses slope factor normalization to apportion allowable risk among the COCs. The slope factors for all carcinogenic COCs are summed, and the percent slope factor contribution to the total is used to determine the percent of the allowable risk that is apportioned to each COC. In this way, the majority of the allowable risk is assigned to the COCs that are the most highly carcinogenic. This technique is superior to the equal distribution technique described above because it results in action levels

c. While this discussion of apportioning risk among COCs is written with respect to determination of action levels using carcinogenic contaminants and risk-based back-calculation, it applies equally to determination of action levels using noncarcinogenic contaminants and hazard-based back-calculation.

for highly carcinogenic contaminants that are above detection limits and realistically achievable, while still maintaining the overall allowable risk below the regulatory threshold. The problem with this approach for the purposes of determining decontamination room-specific action levels for the closure the equipment under consideration is the presence of the carcinogenic benzo(a)pyrene. This contaminant is extremely carcinogenic with respect to the other COCs present in the tank system. Using the normalization approach, consequently, results in the majority of the allowable risk being assigned to this contaminant. This results in greatly reduced action levels for moderately carcinogenic contaminants such as heavy metals. This approach results in decontamination efforts being driven by the need to meet action levels for the metals. Due to the fact that historical data was used to develop the COC list, and the relative ease of decontaminating organic contaminants versus metals, decontamination to meet the action levels for metals will result in actual concentrations of organic constituents that will be far below the action levels for these constituents. This would result in a total residual risk far below the threshold of 1.0E-06. This approach results in decontamination room-specific action levels for various metals that may prove impossible to achieve during closure.

While both approaches described above result in action levels that are compliant with the need to reduce risk below 1.0E-06, the first approach results in an impracticable action level for the highly carcinogenic benzo(a)pyrene. The second approach results in impracticable action levels for a variety of heavy metals. A compromise approach balancing the action levels for benzo(a)pyrene and the metals to achievable, yet protective, levels was developed. This third approach uses logarithmic slope factor normalization to apportion allowable risk among the COCs. A normalizing power of 0.5 was selected via trial and error that resulted in achievable, yet protective, action levels for all COCs. Each of the slope factors was raised to the power of 0.5. These slope factors were then summed, and the percent contribution to this sum of each slope factor was determined. This percent contribution was then used to assign allowable risk to all carcinogenic COCs.

The three approaches above are alternate methods for assigning allowable risk to each COC. The sum of the allowable risk for each approach is the same, at 1.0E-06. Selection of the third technique provides decontamination room-specific action levels that are technically practicable. The true risk resulting from each COC is calculated in Step 7 of this methodology. This true risk is calculated at 7.32EA-07, demonstrating that the selected action levels are compliant with the regulatory threshold of 1.0E-06. The calculation of true residual risk is independent of the apportioning of allowable risk performed in this step.

As discussed above, allowable risk and hazard quotients for each COC for each pathway were normalized logarithmically against their expected percent contribution to the overall risk and hazard for each pathway. For carcinogenic risk, the square root of the slope factor for each COC was determined. The normalized slope factor percentage was determined by dividing the square root of the slope factor for each COC by the sum of the square root of the slope factors for all COCs for a given pathway. This percent contribution was then multiplied by the total pathway-specific allowable risk to calculate the COC- and pathway-specific allowable risk. To increase the conservativeness of the design, correction factors (discussed below) were applied to COCs, as necessary, to reduce the total allowable risk for each COC. The resulting COC pathway-specific allowable risks for ingestion and inhalation are listed in Table A-3.

For a noncarcinogenic hazard, the square root of the inverse of the reference dose for each COC was determined. The normalized inverse reference dose percentage was determined by dividing the square root of the inverse reference dose for each COC by the sum of the square root of the inverse reference doses for all COCs for a given pathway. This percent contribution was then multiplied by the total pathway-specific allowable hazard to calculate the COC- and pathway-specific allowable hazard. To increase the conservativeness of the design, correction factors (discussed below) were applied to COCs, as necessary, to reduce the total allowable hazard for each COC. The resulting COC pathway-specific allowable hazard for ingestion and inhalation are listed in Table A-3.

Table A-3. COC-specific allowable risk and hazard for the soil ingestion and inhalation pathways.

COC	Effective Allowable Ingestion Risk	Effective Allowable Inhalation Risk	Effective Allowable Ingestion Hazard	Effective Allowable Inhalation Hazard
Barium	—	—	6.12E-04	5.50E-05
Cadmium	—	3.38E-12	9.05E-04	—
Chromium	—	5.24E-10	8.44E-03	—
Copper	—	—	1.68E-02	—
Lead	—	—	—	—
Mercury	—	—	2.88E-04	2.16E-06
Nickel	—	—	2.29E-02	—
Silver	—	—	4.58E-04	—
Zinc	—	—	5.91E-03	—
Cyanide (Total)	—	—	7.63E-04	1.48E-05
1,1-Dichloroethene	1.10E-08	7.62E-12	2.84E-03	1.14E-05
1,2-Dichlorobenzene	—	—	1.54E-03	7.78E-06
1,2-Dichloroethene	—	—	6.47E-03	2.60E-05
1,3-Dichlorobenzene	—	—	2.70E-02	1.08E-04
1,4-Dichlorobenzene	2.64E-08	3.20E-11	1.87E-02	2.71E-05
2-Butanone	—	—	1.49E-04	8.63E-07
Dichlrorodifluoromethane	—	—	7.24E-04	5.45E-06
Ethylbenzene	—	—	1.02E-03	2.42E-06
Methylene Chloride	1.47E-08	8.62E-12	1.32E-02	1.40E-05
Tetrachloroethene	5.55E-09	1.38E-12	4.62E-03	5.60E-06
Toluene	—	—	1.21E-03	6.54E-06
Trichloroethene	8.93E-10	8.35E-13	2.09E-03	8.40E-06
1,2,4-Trichlorobenzene	—	—	3.24E-02	5.45E-05
Acenaphthene	—	—	1.32E-02	5.31E-05
Benzo(a)anthracene	1.45E-07	1.20E-10	—	—
Benzo(a)pyrene	3.68E-07	3.04E-10	—	—
Benzo(b)fluoranthene	1.45E-07	1.20E-10	—	—
Butylbenzylphthalate	—	—	7.24E-03	2.91E-05
Chrysene	1.45E-08	1.20E-11	—	—
Diethylphthalate	—	—	3.62E-03	1.45E-05
Di(n)octylphthalate	—	—	2.29E-02	9.20E-05
Fluoranthene	—	—	1.62E-02	6.50E-05
Fluorene	—	—	1.62E-02	6.50E-05
Naphthalene	—	—	3.82E-03	7.39E-05
Phenol	—	—	4.18E-03	1.68E-05
Pyrene	—	—	1.87E-02	7.51E-05
Total	7.32E-07	1.13E-09	2.75E-01	8.35E-04

Correction factors were used in the risk calculations to lower the decontamination room-specific action levels of contaminants to meet regulatory thresholds. Risk calculations alone would produce concentrations greater than the maximum concentration of contaminants for the toxicity characteristic. Correction factors, therefore, were used to augment the risk number to ensure hazardous waste is not left in place. Removing hazardous waste is the first criteria for achieving clean closure for the tank system.

In an effort to develop decontamination room-specific action levels at appropriate concentrations and meet project goals for protection of the public and the environment, correction factors were developed on a case-by-case basis and may vary for different tank systems. Systems that are fairly accessible and with contamination that can be removed to low concentrations will have different correction factors than those used for tank systems that are not easily accessible and where effective decontamination may be more difficult to achieve. Two important points should be recognized:

1. Correction factors are not intended to be the same for all closure actions. Therefore, the DOE can develop action levels as conservative as possible on a project basis.

2. Action levels will always be protective of human health and the environment based on the calculated risks and hazard index.

The use of correction factors is performed to lower decontamination room-specific action levels to concentrations below regulatory thresholds while accounting for project-specific challenges to clean closure. The correction factors are not used to adjust for the uncertainty of any closure project. The difference between the use of correction factors and accounting for uncertainty is clearly established by the following explanation.

Using conservative assumptions when calculating the risk and hazard quotient negates uncertainties associated with meeting the performance standard for clean closure. For example, risk and hazard indices are based on the total number of constituents that may be detected in the unit. Actually, some of these constituents (particularly organic compounds) will not be present after waste removal and decontamination. For example, benzo(a)pyrene is a significant contributor to risk. However, it is likely that this compound will not be detected during final sampling. The total risk will then be reduced by the amount contributed by benzo(a)pyrene. The calculated risk for benzo(a)pyrene from soil ingestion and inhalation is 3.68E-07. This is the greatest risk contributor in the decontamination room piping.

Step 6: Calculate the COC- and Pathway-Specific Action Levels from Allowable Risk and Hazard Calculated in Step 5

The equations used to relate risk, intake factor, and slope factor or reference dose to excess cancer risk or hazard quotient are given in Step 7. These equations were obtained from EPA guidance (EPA 1989). The risk-based COC-specific action levels were calculated from COC-specific allowable risk by dividing the COC-specific allowable risk (Table A-3) by the intake factor coefficient (see Step 7) and the COC-specific slope factor (Table A-1). The hazard-based COC-specific action levels were calculated from COC-specific allowable hazard quotients by dividing the COC-specific allowable hazard quotient (Table A-3) by the intake factor coefficient (see Step 7) and multiplying by the reference dose (Table A-1). The COC-specific action levels for the ingestion and inhalation pathways resulting from COC-specific allowable risk and COC-specific allowable hazard are listed in Table A-4. To be conservative, the minimum pathway-specific action level was used as the overall action level. The final effective decontamination room-specific action levels are provided in the right-hand column of Table A-4.

Table A-4. Pathway-specific and effective decontamination room-specific action levels for each COC.

COC	Action Level (mg/Kg) Ingestion Risk	Action Level (mg/Kg) Inhalation Risk	Action Level (mg/Kg) Ingestion Hazard	Action Level (mg/Kg) Inhalation Hazard	Effective Action Level (mg/Kg)
Barium	—	—	8.8E+01	6.9E+03	8.8E+01
Cadmium	—	1.3E+00	9.3E-01	—	9.3E-01
Chromium	—	4.5E+00	5.2E+01	—	4.5E+00
Copper	—	—	1.3E+03	—	1.3E+03
Lead	—	—	—	—	0.0E+00[a]
Mercury	—	—	1.8E-01	1.7E+02	1.8E-01
Nickel	—	—	9.4E+02	—	9.4E+02
Silver	—	—	4.7E+00	—	4.7E+00
Zinc	—	—	3.6E+03	—	3.6E+03
Cyanide (Total)	—	—	3.1E+01	1.1E+04	3.1E+01
1,1-Dichloroethene	1.0E-01	1.1E+02	5.2E+01	9.2E+04	1.0E-01
1,2-Dichlorobenzene	—	—	2.8E+02	4.0E+05	2.8E+02
1,2-Dichloroethene	—	—	1.3E+02	2.3E+05	1.3E+02
1,3-Dichlorobenzene	—	—	5.0E+01	8.7E+04	5.0E+01
1,4-Dichlorobenzene	6.3E+00	3.6E+03	1.1E+03	5.6E+06	6.3E+00
2-Butanone	—	—	1.8E+02	2.2E+05	1.8E+02
Dichlrorodifluoromethane	—	—	3.0E+02	2.8E+05	3.0E+02
Ethylbenzene	—	—	2.1E+02	6.3E+05	2.1E+02
Methylene Chloride	1.1E+01	1.3E+04	1.6E+03	1.1E+07	1.1E+01
Tetrachloroethene	6.1E-01	1.7E+03	9.5E+01	5.5E+05	6.1E-01
Toluene	—	—	4.9E+02	6.4E+05	4.9E+02
Trichloroethene	4.6E-01	3.5E+02	2.6E+01	4.5E+04	4.6E-01
1,2,4-Trichlorobenzene	—	—	6.6E+02	2.8E+06	6.6E+02
Acenaphthene	—	—	1.6E+03	2.8E+06	1.6E+03
Benzo(a)anthracene	1.1E+00	9.7E+02	—	—	1.1E+00
Benzo(a)pyrene	2.9E-01	2.4E+02	—	—	2.9E-01
Benzo(b)fluoranthene	1.1E+00	9.7E+02	—	—	1.1E+00
Butylbenzylphthalate	—	—	3.0E+03	5.2E+06	3.0E+03
Chrysene	1.1E+01	9.7E+03	—	—	1.1E+01
Diethylphthalate	—	—	5.9E+03	1.0E+07	5.9E+03
Di(n)octylphthalate	—	—	9.4E+02	1.6E+06	9.4E+02
Fluoranthene	—	—	1.3E+03	2.3E+06	1.3E+03
Fluorene	—	—	1.3E+03	2.3E+06	1.3E+03
Naphthalene	—	—	1.6E+02	5.7E+04	1.6E+02
Phenol	—	—	5.1E+03	9.0E+06	5.1E+03
Pyrene	—	—	1.1E+03	2.0E+06	1.1E+03

a. The decontamination room-specific action level for lead cannot be determined using a risk-based approach, as there are currently no established toxicity parameters for lead. The action level for lead was developed as described in Step 8.

Step 7: Determine the True Excess Cancer Risk and Hazard Quotient Resulting in the Decontamination Room-Specific Action Levels Calculated in Step 7

Soil concentrations resulting from the calculated decontamination room-specific action levels were used as a starting point to assess the risk and hazard to the occupational receptor via the soil ingestion and inhalation pathways. The results of this analysis are provided in Table A-5. The table also includes the cumulative risk and hazard posed by both pathways. The calculation spreadsheets are shown on the following pages in Equations (A-1) through (A-9) and Tables A-6 through A-9.

Table A-5. Cumulative excess cancer risk resulting from soil ingestion and soil inhalation pathways to an occupational receptor from contaminated soil at the effective decontamination room-specific action levels presented in Table A-4.

COC	Risk (Ingestion Pathway)	Risk (Inhalation Pathway)	Total Risk	Hazard Quotient (Ingestion Pathway)	Hazard Quotient (Inhalation Pathway)	Total Hazard Quotient
Barium	—	—	—	6.12E-04	7.00E-07	6.13E-04
Cadmium	—	2.34E-12	2.34E-12	9.05E-04	—	9.05E-04
Chromium	—	5.24E-10	5.24E-10	7.35E-04	—	7.35E-04
Copper	—	—	—	1.68E-02	—	1.68E-02
Lead	—	—	—	-	—	—
Mercury	—	—	—	2.88E-04	2.30E-09	2.88E-04
Nickel	—	—	—	2.29E-02	—	2.29E-02
Silver	—	—	—	4.58E-04	—	4.58E-04
Zinc	—	—	—	5.91E-03	—	5.91E-03
Cyanide (Total)	—	—	—	7.63E-04	4.06E-08	7.63E-04
1,1-Dichloroethene	1.10E-08	7.55E-15	1.10E-08	5.68E-06	1.30E-11	5.68E-06
1,2-Dichlorobenzene	—	—	—	1.54E-03	5.57E-09	1.54E-03
1,2-Dichloroethene	—	—	—	6.47E-03	1.48E-08	6.47E-03
1,3-Dichlorobenzene	—	—	—	2.70E-02	6.18E-08	2.70E-02
1,4-Dichlorobenzene	2.64E-08	5.53E-14	2.64E-08	1.02E-04	3.06E-11	1.02E-04
2-Butanone	—	—	—	1.49E-04	7.07E-10	1.49E-04
Dichlrorodifluoromethane	—	—	—	7.24E-04	5.82E-09	7.24E-04
Ethylbenzene	—	—	—	1.02E-03	8.08E-10	1.02E-03
Methylene Chloride	1.47E-08	7.20E-15	1.47E-08	9.15E-05	1.46E-11	9.15E-05
Tetrachloroethene	5.55E-09	4.88E-16	5.55E-09	2.98E-05	6.20E-12	2.98E-05
Toluene	—	—	—	1.21E-03	5.02E-09	1.21E-03
Trichloroethene	8.93E-10	1.11E-15	8.93E-10	3.78E-05	8.65E-11	3.78E-05
1,2,4-Trichlorobenzene	—	—	—	3.24E-02	1.30E-08	3.24E-02
Acenaphthene	—	—	—	1.32E-02	3.03E-08	1.32E-02
Benzo(a)anthracene	1.45E-07	1.41E-13	1.45E-07	—	—	—
Benzo(a)pyrene	3.68E-07	3.58E-13	3.68E-07	—	—	—
Benzo(b)fluoranthene	1.45E-07	1.41E-13	1.45E-07	—	—	—
Butylbenzylphthalate	—	—	—	7.24E-03	1.66E-08	7.24E-03
Chrysene	1.45E-08	1.41E-14	1.45E-08	—	—	—
Diethylphthalate	—	—	—	3.62E-03	8.29E-09	3.62E-03
Di(n)octylphthalate	—	—	—	2.29E-02	5.24E-08	2.29E-02
Fluoranthene	—	—	—	1.62E-02	3.71E-08	1.62E-02
Fluorene	—	—	—	1.62E-02	3.71E-08	1.62E-02
Naphthalene	—	—	—	3.82E-03	2.03E-07	3.82E-03
Phenol	—	—	—	4.18E-03	9.57E-09	4.18E-03
Pyrene	—	—	—	1.87E-02	4.28E-08	1.87E-02
Total	7.32E-07	5.27E-10	7.32E-07	2.26E-01	1.29E-06	2.26E-01

Occupational Soil Ingestion

$$Intake\ Factor = \left(\frac{C \times FI \times EF \times CF}{AT}\right) \times \left(\frac{IR \times ED}{BW}\right) \quad \text{(A-1)}$$

where

C	=	contaminant concentration (mg/kg) (contaminant dependent)
FI	=	fraction ingested from source = 1
EF	=	exposure frequency (day/year) = 250
CF	=	conversion factor (kg/mg) = 1.00E-06
AT	=	averaging time (day) = 2.55E+04
IR	=	ingestion rate (mg/day) = 50
ED	=	exposure duration (year) = 25
BW	=	body weight (kg) = 70

Assumption: Each liter of leachate contaminates 1 kg of soil.

Risk = Intake Factor × Slope Factor (A-2)

Table A-6. Calculation of excess cancer risk for an occupational soil ingestion scenario using the decontamination room-specific action levels provided in Table A-4.

Constituent	C (mg/Kg)	Intake Factor/C (1/day)	Intake Factor (mg/Kg-day)	Slope Factor (Kg-day/mg)	Risk	Risk Percentage
Barium	8.76E+01	1.75E-07	1.53E-05	0.00E+00	—	—
Cadmium	9.25E-01	1.75E-07	1.62E-07	0.00E+00	—	—
Chromium	4.51E+00	1.75E-07	7.89E-07	0.00E+00	—	—
Copper	1.27E+03	1.75E-07	2.23E-04	0.00E+00	—	—
Lead	0.00E+00	1.75E-07	0.00E+00	0.00E+00	—	—
Mercury	1.76E-01	1.75E-07	3.09E-08	0.00E+00	—	—
Nickel	9.36E+02	1.75E-07	1.64E-04	0.00E+00	—	—
Silver	4.68E+00	1.75E-07	8.20E-07	0.00E+00	—	—
Zinc	3.63E+03	1.75E-07	6.35E-04	0.00E+00	—	—
Cyanide (Total)	3.12E+01	1.75E-07	5.46E-06	0.00E+00	—	—
1,1-Dichloroethene	1.05E-01	1.75E-07	1.83E-08	6.00E-01	1.10E-08	1.50%
1,2-Dichlorobenzene	2.84E+02	1.75E-07	4.97E-05	0.00E+00	—	—
1,2-Dichloroethene	1.32E+02	1.75E-07	2.32E-05	0.00E+00	—	—
1,3-Dichlorobenzene	4.97E+01	1.75E-07	8.69E-06	0.00E+00	—	—
1,4-Dichlorobenzene	6.28E+00	1.75E-07	1.10E-06	2.40E-02	2.64E-08	3.60%
2-Butanone	1.83E+02	1.75E-07	3.21E-05	0.00E+00	—	—
Dichlrorodifluoromethane	2.96E+02	1.75E-07	5.18E-05	0.00E+00	—	—
Ethylbenzene	2.09E+02	1.75E-07	3.67E-05	0.00E+00	—	—
Methylene Chloride	1.12E+01	1.75E-07	1.97E-06	7.50E-03	1.47E-08	2.01%
Tetrachloroethene	6.09E-01	1.75E-07	1.07E-07	5.20E-02	5.55E-09	0.76%
Toluene	4.93E+02	1.75E-07	8.64E-05	0.00E+00	—	—
Trichloroethene	4.64E-01	1.75E-07	8.12E-08	1.10E-02	8.93E-10	0.12%
1,2,4-Trichlorobenzene	6.62E+02	1.75E-07	1.16E-04	0.00E+00	—	—
Acenaphthene	1.62E+03	1.75E-07	2.84E-04	0.00E+00	—	—
Benzo(a)anthracene	1.14E+00	1.75E-07	1.99E-07	7.30E-01	1.45E-07	19.87%
Benzo(a)pyrene	2.88E-01	1.75E-07	5.04E-08	7.30E+00	3.68E-07	50.27%
Benzo(b)fluoranthene	1.14E+00	1.75E-07	1.99E-07	7.30E-01	1.45E-07	19.87%
Butylbenzylphthalate	2.96E+03	1.75E-07	5.18E-04	0.00E+00	—	—
Chrysene	1.14E+01	1.75E-07	1.99E-06	7.30E-03	1.45E-08	1.99%
Diethylphthalate	5.92E+03	1.75E-07	1.04E-03	0.00E+00	—	—
Di(n)octylphthalate	9.36E+02	1.75E-07	1.64E-04	0.00E+00	—	—
Fluoranthene	1.32E+03	1.75E-07	2.32E-04	0.00E+00	—	—
Fluorene	1.32E+03	1.75E-07	2.32E-04	0.00E+00	—	—
Naphthalene	1.56E+02	1.75E-07	2.73E-05	0.00E+00	—	—
Phenol	5.13E+03	1.75E-07	8.98E-04	0.00E+00	—	—
Pyrene	1.15E+03	1.75E-07	2.01E-04	0.00E+00	—	—
Total					7.32E-07	100.00%

Occupational Soil Inhalation

$$Intake\ Factor = \left(\frac{C \times IR \times EF \times ET \times ED}{BW \times AT \times PEF}\right) \quad \text{(A-3)}$$

where

C	=	soil contaminant concentration (mg/kg) (contaminant dependent)
IR	=	inhalation rate (m^3/hr) = 0.83
EF	=	exposure frequency (day/year) = 250
ET	=	exposure time (hour/day) = 8
ED	=	exposure duration (year) = 25
BW	=	body weight (kg) = 70
AT	=	averaging time (day) = 2.55E+04
PEF	=	particulate emission factor (m^3/kg) (calculated)

$$PEF = \frac{LS \times 5.8\mathrm{E}+10}{A}\left(\frac{m^4}{kg}\right) \quad \text{(A-4)}$$

where

LS	=	prevailing wind field dimension (m) = 70
A	=	area of contamination (m^2) = 70

Assumption: Each liter of leachate contaminates 1 kg of soil.

$$Risk = Intake\ Factor \times Slope\ Factor \quad \text{(A-5)}$$

Table A-7. Calculation of excess cancer risk for an occupational soil inhalation scenario using the decontamination room-specific action levels provided in Table A-4.

Constituent	C (mg/Kg)	Intake Factor/C (1/day)	Intake Factor (mg/Kg-day)	Slope Factor (Kg-day/mg)	Risk	Risk Percentage
Barium	8.76E+01	4.01E-13	3.51E-11	0.00E+00	—	—
Cadmium	9.25E-01	4.01E-13	3.71E-13	6.30E+00	2.34E-12	0.44%
Chromium	4.51E+00	4.01E-13	1.81E-12	2.90E+02	5.24E-10	99.42%
Copper	1.27E+03	4.01E-13	5.11E-10	0.00E+00	—	—
Lead	0.00E+00	4.01E-13	0.00E+00	0.00E+00	—	—
Mercury	1.76E-01	4.01E-13	7.07E-14	0.00E+00	—	—
Nickel	9.36E+02	4.01E-13	3.75E-10	0.00E+00	—	—
Silver	4.68E+00	4.01E-13	1.88E-12	0.00E+00	—	—
Zinc	3.63E+03	4.01E-13	1.45E-09	0.00E+00	—	—
Cyanide (Total)	3.12E+01	4.01E-13	1.25E-11	0.00E+00	—	—
1,1-Dichloroethene	1.05E-01	4.01E-13	4.19E-14	1.80E-01	7.55E-15	0.00%
1,2-Dichlorobenzene	2.84E+02	4.01E-13	1.14E-10	0.00E+00	—	—
1,2-Dichloroethene	1.32E+02	4.01E-13	5.31E-11	0.00E+00	—	—
1,3-Dichlorobenzene	4.97E+01	4.01E-13	1.99E-11	0.00E+00	—	—
1,4-Dichlorobenzene	6.28E+00	4.01E-13	2.52E-12	2.20E-02	5.53E-14	0.01%
2-Butanone	1.83E+02	4.01E-13	7.34E-11	0.00E+00	—	—
Dichlrorodifluoromethane	2.96E+02	4.01E-13	1.19E-10	0.00E+00	—	—
Ethylbenzene	2.09E+02	4.01E-13	8.39E-11	0.00E+00	—	—
Methylene Chloride	1.12E+01	4.01E-13	4.50E-12	1.60E-03	7.20E-15	0.00%
Tetrachloroethene	6.09E-01	4.01E-13	2.44E-13	2.00E-03	4.88E-16	0.00%
Toluene	4.93E+02	4.01E-13	1.98E-10	0.00E+00	—	—
Trichloroethene	4.64E-01	4.01E-13	1.86E-13	6.00E-03	1.11E-15	0.00%
1,2,4-Trichlorobenzene	6.62E+02	4.01E-13	2.65E-10	0.00E+00	—	—
Acenaphthene	1.62E+03	4.01E-13	6.50E-10	0.00E+00	—	—
Benzo(a)anthracene	1.14E+00	4.01E-13	4.56E-13	3.10E-01	1.41E-13	0.03%
Benzo(a)pyrene	2.88E-01	4.01E-13	1.15E-13	3.10E+00	3.58E-13	0.07%
Benzo(b)fluoranthene	1.14E+00	4.01E-13	4.56E-13	3.10E-01	1.41E-13	0.03%
Butylbenzylphthalate	2.96E+03	4.01E-13	1.19E-09	0.00E+00	—	—
Chrysene	1.14E+01	4.01E-13	4.56E-12	3.10E-03	1.41E-14	0.00%
Diethylphthalate	5.92E+03	4.01E-13	2.37E-09	0.00E+00	—	—
Di(n)octylphthalate	9.36E+02	4.01E-13	3.75E-10	0.00E+00	—	—
Fluoranthene	1.32E+03	4.01E-13	5.31E-10	0.00E+00	—	—
Fluorene	1.32E+03	4.01E-13	5.31E-10	0.00E+00	—	—
Naphthalene	1.56E+02	4.01E-13	6.26E-11	0.00E+00	—	—
Phenol	5.13E+03	4.01E-13	2.06E-09	0.00E+00	—	—
Pyrene	1.15E+03	4.01E-13	4.60E-10	0.00E+00	—	—
Total					5.27E-10	100.00%

Occupational Soil Ingestion

$$Intake\ Factor = \left(\frac{C \times FI \times EF \times CF}{AT}\right) \times \left(\frac{IR \times ED}{BW}\right) \qquad \text{(A-6)}$$

where

C	=	contaminant concentration (mg/kg) (contaminant dependent)
FI	=	fraction ingested from source = 1
EF	=	exposure frequency (day/year) = 250
CF	=	conversion factor (kg/mg) = 1.00E-06
AT	=	averaging time (day) = 9.13E+03
IR	=	ingestion rate (mg/day) = 50
ED	=	exposure duration (year) = 25
BW	=	body weight (kg) = 70

Assumption: Each liter of leachate contaminates 1 kg of soil.

$$Hazard = Intake\ Factor/Reference\ Dose \qquad \text{(A-7)}$$

Table A-8. Calculation of hazard quotient for an occupational soil ingestion scenario using the decontamination room-specific action levels provided in Table A-4.

Constituent	C (mg/Kg)	Intake Factor/C (1/day)	Intake Factor (mg/Kg/day)	Reference Dose (mg/Kg/day)	Hazard Quotient	Hazard Quotient Percentage
Barium	8.76E+01	4.89E-07	4.28E-05	7.00E-02	6.12E-04	0.27%
Cadmium	9.25E-01	4.89E-07	4.52E-07	5.00E-04	9.05E-04	0.40%
Chromium	4.51E+00	4.89E-07	2.20E-06	3.00E-03	7.35E-04	0.32%
Copper	1.27E+03	4.89E-07	6.23E-04	3.70E-02	1.68E-02	7.44%
Lead	0.00E+00	4.89E-07	0.00E+00	0.00E+00	—	—
Mercury	1.76E-01	4.89E-07	8.63E-08	3.00E-04	2.88E-04	0.13%
Nickel	9.36E+02	4.89E-07	4.58E-04	2.00E-02	2.29E-02	10.12%
Silver	4.68E+00	4.89E-07	2.29E-06	5.00E-03	4.58E-04	0.20%
Zinc	3.63E+03	4.89E-07	1.77E-03	3.00E-01	5.91E-03	2.61%
Cyanide (Total)	3.12E+01	4.89E-07	1.53E-05	2.00E-02	7.63E-04	0.34%
1,1-Dichloroethene	1.05E-01	4.89E-07	5.11E-08	9.00E-03	5.68E-06	0.00%
1,2-Dichlorobenzene	2.84E+02	4.89E-07	1.39E-04	9.00E-02	1.54E-03	0.68%
1,2-Dichloroethene	1.32E+02	4.89E-07	6.47E-05	1.00E-02	6.47E-03	2.86%
1,3-Dichlorobenzene	4.97E+01	4.89E-07	2.43E-05	9.00E-04	2.70E-02	11.93%
1,4-Dichlorobenzene	6.28E+00	4.89E-07	3.07E-06	3.00E-02	1.02E-04	0.05%
2-Butanone	1.83E+02	4.89E-07	8.96E-05	6.00E-01	1.49E-04	0.07%
Dichlrorodifluoromethane	2.96E+02	4.89E-07	1.45E-04	2.00E-01	7.24E-04	0.32%
Ethylbenzene	2.09E+02	4.89E-07	1.02E-04	1.00E-01	1.02E-03	0.45%
Methylene Chloride	1.12E+01	4.89E-07	5.49E-06	6.00E-02	9.15E-05	0.04%
Tetrachloroethene	6.09E-01	4.89E-07	2.98E-07	1.00E-02	2.98E-05	0.01%
Toluene	4.93E+02	4.89E-07	2.41E-04	2.00E-01	1.21E-03	0.53%
Trichloroethene	4.64E-01	4.89E-07	2.27E-07	6.00E-03	3.78E-05	0.02%
1,2,4-Trichlorobenzene	6.62E+02	4.89E-07	3.24E-04	1.00E-02	3.24E-02	14.31%
Acenaphthene	1.62E+03	4.89E-07	7.93E-04	6.00E-02	1.32E-02	5.84%
Benzo(a)anthracene	1.14E+00	4.89E-07	5.56E-07	0.00E+00	—	—
Benzo(a)pyrene	2.88E-01	4.89E-07	1.41E-07	0.00E+00	—	—
Benzo(b)fluoranthene	1.14E+00	4.89E-07	5.56E-07	0.00E+00	—	—
Butylbenzylphthalate	2.96E+03	4.89E-07	1.45E-03	2.00E-01	7.24E-03	3.20%
Chrysene	1.14E+01	4.89E-07	5.56E-06	0.00E+00	—	—
Diethylphthalate	5.92E+03	4.89E-07	2.90E-03	8.00E-01	3.62E-03	1.60%
Di(n)octylphthalate	9.36E+02	4.89E-07	4.58E-04	2.00E-02	2.29E-02	10.12%
Fluoranthene	1.32E+03	4.89E-07	6.47E-04	4.00E-02	1.62E-02	7.16%
Fluorene	1.32E+03	4.89E-07	6.47E-04	4.00E-02	1.62E-02	7.16%
Naphthalene	1.56E+02	4.89E-07	7.63E-05	2.00E-02	3.82E-03	1.69%
Phenol	5.13E+03	4.89E-07	2.51E-03	6.00E-01	4.18E-03	1.85%
Pyrene	1.15E+03	4.89E-07	5.61E-04	3.00E-02	1.87E-02	8.26%
Total					2.26E-01	100.00%

Occupational Soil Inhalation

$$Intake\ Factor = \left(\frac{C \times IR \times EF \times ET \times ED}{BW \times AT \times PEF}\right) \qquad \text{(A-8)}$$

where

C	=	soil contaminant concentration (mg/kg) (contaminant dependent)
IR	=	inhalation rate (m^3/hr) = 0.83
EF	=	exposure frequency (day/year) = 250
ET	=	exposure time (hour/day) = 8
ED	=	exposure duration (year) = 25
BW	=	body weight (kg) = 70
AT	=	averaging time (day) = 9.13E+03
PEF	=	particulate emission factor (m^3/kg) (calculated)

$$PEF = \frac{LS \times 5.8\mathrm{E}+10}{A}\left(\frac{m^4}{kg}\right)$$

where

LS	=	prevailing wind field dimension (m) = 70
A	=	area of contamination (m^2) = 70

Assumption: Each liter of leachate contaminates 1 kg of soil.

Hazard = Intake Factor/Reference Dose (A-9)

Table A-9. Calculation of hazard quotient for an occupational soil inhalation scenario using the decontamination room-specific action levels provided in Table A-4.

Constituent	C (mg/Kg)	Intake Factor/C (1/day)	Intake Factor (mg/Kg-day)	Reference Dose (mg/Kg/day)	HQ	HQ Percentage
Barium	8.76E+01	1.12E-12	9.81E-11	1.40E-04	7.00E-07	54.37%
Cadmium	9.25E-01	1.12E-12	1.04E-12	0.00E+00	—	—
Chromium	4.51E+00	1.12E-12	5.05E-12	0.00E+00	—	—
Copper	1.27E+03	1.12E-12	1.43E-09	0.00E+00	—	—
Lead	0.00E+00	1.12E-12	0.00E+00	0.00E+00	—	—
Mercury	1.76E-01	1.12E-12	1.98E-13	8.60E-05	2.30E-09	0.18%
Nickel	9.36E+02	1.12E-12	1.05E-09	0.00E+00	—	—
Silver	4.68E+00	1.12E-12	5.24E-12	0.00E+00	—	—
Zinc	3.63E+03	1.12E-12	4.06E-09	0.00E+00	—	—
Cyanide (Total)	3.12E+01	1.12E-12	3.49E-11	8.60E-04	4.06E-08	3.15%
1,1-Dichloroethene	1.05E-01	1.12E-12	1.17E-13	9.00E-03	1.30E-11	0.00%
1,2-Dichlorobenzene	2.84E+02	1.12E-12	3.18E-10	5.70E-02	5.57E-09	0.43%
1,2-Dichloroethene	1.32E+02	1.12E-12	1.48E-10	1.00E-02	1.48E-08	1.15%
1,3-Dichlorobenzene	4.97E+01	1.12E-12	5.56E-11	9.00E-04	6.18E-08	4.80%
1,4-Dichlorobenzene	6.28E+00	1.12E-12	7.03E-12	2.30E-01	3.06E-11	0.00%
2-Butanone	1.83E+02	1.12E-12	2.05E-10	2.90E-01	7.07E-10	0.05%
Dichlrorodifluoromethane	2.96E+02	1.12E-12	3.31E-10	5.70E-02	5.82E-09	0.45%
Ethylbenzene	2.09E+02	1.12E-12	2.34E-10	2.90E-01	8.08E-10	0.06%
Methylene Chloride	1.12E+01	1.12E-12	1.26E-11	8.60E-01	1.46E-11	0.00%
Tetrachloroethene	6.09E-01	1.12E-12	6.82E-13	1.10E-01	6.20E-12	0.00%
Toluene	4.93E+02	1.12E-12	5.52E-10	1.10E-01	5.02E-09	0.39%
Trichloroethene	4.64E-01	1.12E-12	5.19E-13	6.00E-03	8.65E-11	0.01%
1,2,4-Trichlorobenzene	6.62E+02	1.12E-12	7.41E-10	5.70E-02	1.30E-08	1.01%
Acenaphthene	1.62E+03	1.12E-12	1.82E-09	6.00E-02	3.03E-08	2.35%
Benzo(a)anthracene	1.14E+00	1.12E-12	1.27E-12	0.00E+00	—	—
Benzo(a)pyrene	2.88E-01	1.12E-12	3.22E-13	0.00E+00	—	—
Benzo(b)fluoranthene	1.14E+00	1.12E-12	1.27E-12	0.00E+00	—	—
Butylbenzylphthalate	2.96E+03	1.12E-12	3.31E-09	2.00E-01	1.66E-08	1.29%
Chrysene	1.14E+01	1.12E-12	1.27E-11	0.00E+00	—	—
Diethylphthalate	5.92E+03	1.12E-12	6.63E-09	8.00E-01	8.29E-09	0.64%
Di(n)octylphthalate	9.36E+02	1.12E-12	1.05E-09	2.00E-02	5.24E-08	4.07%
Fluoranthene	1.32E+03	1.12E-12	1.48E-09	4.00E-02	3.71E-08	2.88%
Fluorene	1.32E+03	1.12E-12	1.48E-09	4.00E-02	3.71E-08	2.88%
Naphthalene	1.56E+02	1.12E-12	1.75E-10	8.60E-04	2.03E-07	15.77%
Phenol	5.13E+03	1.12E-12	5.74E-09	6.00E-01	9.57E-09	0.74%
Pyrene	1.15E+03	1.12E-12	1.28E-09	3.00E-02	4.28E-08	3.32%
Total					1.29E-06	100.00%

Step 8: Determine a Decontamination Room-Specific Action Level for Lead

Of the COCs currently applicable to the decontamination room piping, only lead does not have a reference dose or a slope factor. The following discussion offers an approach for establishing a decontamination room-specific action level for lead. Soil screening guidance (EPA 2001b) suggests a lead soil concentration of 400 mg/kg based on *Revised Interim Soil Lead Guidance for CERCLA Sites and RCRA Corrective Action Facilities* (EPA 1994). The liquid lead concentration is calculated using the definition of K_d. The K_d value is the ratio of the soil concentration to the liquid concentration. Thus, the action level is calculated by dividing the suggested soil concentration for lead by the K_d. The K_d of lead is 100 cm^3/g (EPA 1996). With these values, lead action level is calculated at 4 mg/L.

REFERENCES

40 CFR 265.111, 2001, "Closure Performance Standard," *Code of Federal Regulations*, Office of the Federal Register, July 1.

40 CFR 265.197, 2001, "Closure and Post-closure Care," *Code of Federal Regulations*, Office of the Federal Register, July 1.

42 USC 6901 et seq., 1976, "Resource Conservation and Recovery Act of 1976," as amended.

55 FR 46, 1990, "National Oil and Hazardous Substances Pollution Contingency Plan," *Federal Register*, Environmental Protection Agency, pp. 8666–8673, March 8.

55 FR 145, 1990, "Corrective Action for Solid Waste Management Units (SWMUs) at Hazardous Waste Management Facilities," *Federal Register*, Environmental Protection Agency, p. 30798, July 27.

61 FR 85, 1996, "Corrective Action for Releases from Solid Waste Management Units at Hazardous Waste Management Facilities," *Federal Register*, Environmental Protection Agency, pp. 19432-19464, May 1.

EPA, 1989, *Risk Assessment Guidance for Superfund, Volume 1, Human Health Evaluation Manual (Part A),* EPA/540/1/1-89/002, December.

EPA, 1994, *Revised Interim Soil Lead Guidance for CERCLA Sites and RCRA Corrective Action Facilities*.

EPA, 1996, *Soil Screening Guidance: Technical Background Document*, EPA/540/R95/128, NTIS PB96-963502, Office of Emergency and Remedial Response, Washington, DC.

EPA, 2001a, *EPA Region 9 Preliminary Remediation Goals*, http://www.epa.gov/Region9/waste/sfund/prg/index.htm, Web page updated October 3, 2002, Web page visited February 24, 2003.

EPA, 2001b, *Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites*, Peer Draft Review, OSWER 9355.4-24, March.

State of Idaho, 1983, "Hazardous Waste Management," Idaho Statute, Title 39, "Health and Safety," Chapter 44, "Hazardous Waste Management" (also known as the Hazardous Waste Management Act of 1983).